INTERNATIONAL INSTITUTE OF AGRICULTURE
BUREAU OF AGRICULTURAL INTELLIGENCE AND PLANT DISEASES

INTERNATIONAL REVIEW OF THE SCIENCE AND PRACTICE OF AGRICULTURE

MONTHLY BULLETIN
OF AGRICULTURAL INTELLIGENCE AND PLANT DISEASES

YEAR VIII - NUMBER 3
MARCH 1917

ROME
PRINTING OFFICE OF THE INSTITUTE
1917

In quoting articles, please mention this BULLETIN.

CONTENTS

FIRST PART: ORIGINAL ARTICLES.

MAXIME TOUBEAU: The Organisation for the Prevention of Fraud in France. *Page* 319.

SECOND PART: ABSTRACTS.

AGRICULTURAL INTELLIGENCE.

I. — GENERAL INFORMATION.

LEGISLATIVE AND ADMINISTRATIVE MEASURES. — 214. Appropriations of the Federal Department of Agriculture of the United States for the Fiscal Year Ending June 30, 1917.

DEVELOPMENT OF AGRICULTURE IN DIFFERENT COUNTRIES. — 215. The Distribution of Crops and Farm Animals in the United States.

RAL HYGIENE. — 216. Pigs and the Spread of the Ectoparasites of Man in Tropical Regions.

RICULTURAL EDUCATION. — 217. The First 37 Years of the Royal Hungarian School for " Maîtres d'eau " at Kassa (1879-1916). — 218. The Foundation of a National School of Veterinary Medicine in Mexico.

RICULTURAL INSTITUTIONS. — 219. The Activity, During the Agricultural Season (1914-1915), of the Various Branches of the Agricultural Administration of Tunis.

II. — CROPS AND CULTIVATION.

a) GENERAL.

RICULTURAL METEOROLOGY. — 220. Effect of Meteorological Factors on the Germinating Capacity of Seeds. — 221. Influence of Meteorological Factors on the Development and Yield of the Millets *Panicum miliaceum* and *Setaria italica*, in Russia.

IL PHYSICS, CHEMISTRY AND MICROBIOLOGY. — 222. Water Penetration in the Gumbo Soils of the Bellefourche Reclamation Project, South Dakota, United States.

ERMANENT IMPROVEMENT, DRAINAGE AND IRRIGATION. — 223. Drainage and Cultivation of the Poitevin Marsh, France. — 224. Irrigation Work in Chili.

b) SPECIAL.

AGRICULTURAL BOTANY, CHEMISTRY AND PHYSIOLOGY OF PLANTS. — 225. Researches on the Method used for Determining the Water-content and the Dry Matter in Vegetable Products. — 226. The Chemical Composition of the Mulberry Leaf. — 227. On the Resistance of Plants to Withering. — 228. The Function of Anabiosis in the Hibernation of Winter Grain Crops. — 229. Effect of Sodium Salts in Water Cultures on the Absorption of Plant Food by Wheat Seedlings. — 230. The Assimilation of Nutrients by the Rice Plant: Studies made in India.

PLANT BREEDING. — 231. Studies in Oat Breeding in Maine, United States. — 232. A Genetic Study of Plant Height in *Phaseolus vulgaris*. — 233. Some Recent Investigations in Sugar-Beet Breeding in the United States.

AGRICULTURAL SEEDS. — 234. Production of Seed of Sugar-Beet in Russia. — 235. Tests of the Cultural Value of Vetch Seeds being Residues from Milling, in Hungary. — 236. The Determination of the Weight of Seeds per Unit Volume: Official Method and Apparatus Adopted in the United States.

CEREALS AND PULSE CROPS. — 237. Improvement of Ghirka Spring Wheat in Yield and Quantity. — 238. Trials of Foreign Varieties of Wheat in Spain. — 239. The Growth and Yield of the Millets *Panicum miliaceum* and *Setaria italica* in Russia and their Relationship to Meteorological Factors.

STARCH CROPS. — 240. Growing of Early Season Potatoes from Sprouts.

FORAGE CROPS, MEADOWS AND PASTURES. — 241. *Danthonia semiannularis* and *D. pilosa*. Plants Used in Pasture Formation in New Zealand.

FIBRE CROPS. — 242. A Sowing Date Experiment with Egyptian Cotton. — 243. Cotton Growing Prospects in the French Colonies, Results in Algeria.

RUBBER, GUM AND RESIN PLANTS. — 244. Rubber Investigations at the Central Rubber Station. — 245. The Rubber Industry in Malaya. — 246. Observations in Java on the Mould attacking Sheet Rubber.

STIMULANT, AROMATIC, NARCOTIC AND MEDICINAL PLANTS. — 247. The Effect of Cultural and Climatic Conditions on the Yield and Quality of Peppermint Oil. — 248. Trials on the Cultivation of the Opium Poppy by the Bezentchouk Agronomic Station in the Province of Samara, Russia.

HORTICULTURE. — 249. Culture and Forcing of Witloof Chicory. — 250. *Martynia proboscidea*, a Vegetable which should be more Extensively Grown in the United States.

FRUIT GROWING. — 251. New Experiments in Pruning Apple trees in Oregon, United States.

VINE GROWING. — 252. Good Hybrid Direct Bearers Cultivated in France. — 253. The Chemical Composition of American Grapes Grown in the Central and Eastern States.

III. — LIVE STOCK AND BREEDING.

a) GENERAL.

HYGIENE OF LIVESTOCK. — 254. Observations on Some Insect Pests of Livestock in the Belgian Congo. — 255. Studies on Contagious Abortion in Mares. — 256. Injury to Ducklings Caused by the Larvae of the Coleopteron *Dermestes lardarius*.

FEEDS AND FEEDING. — 257. The Valuation of Feeding Stuffs. — 258. Net Energy Values for Ruminants. — 259. Chemical Composition, Digestibility and Feeding

Value of Vegetable-Ivory Meal. — 260. Comparative Results of Feeding Guinea-Pigs with Whole Grains of Barley in the " Quiescent " and in the Germinating State. — 261. Improvement in the Method of Apportioning the Mangel Ration. — 262. Feeding Tests for the Toxic Effect of the Seeds of *Adonis aestivalis* contained in Milling Residues in Hungary.

Breeding. — 263. Data on the Measurement of Inbreeding.

Stock Raising: Organisation and Encouragement. — 264. The Herd and Stud Books of the Argentine Rural Society.

b) Special.

Cattle. — 265. Economics of the Breeding of Pure-Bred Stock. — 266. A Cattle Reserve in Nigeria.

Sericulture. — 267. Studies made by the Imperial Sericultural Station of Japan.

IV. — Farm Engineering.

Agricultural Machinery and Implements. — 268. Exhibition and Trial of New Agricultural Machinery and Appliances organised by the German Agricultural Society in 1916 — 269. Whiting Standard Agricultural Tractor. — 270. Trailer for Men who have lost a Leg. — 271. Improved Apparatus for Determining the Test Weight of Grain, with a Standard Method of Making the Test. — 272. The " Cataract " Root Washer and Peeler. — 273. Hinman Mechanical Milkers. — 274. Tests of Mechanical Cultivators in the Indre Department, France. — 275. Review of Patents.

V. — Rural Economics.

276. The Normal Day's Work of Farm Implements, Workmen, and Crews in Western New York. — 277. The Valuation of Feeding Stuffs.

VI. — Agricultural Industries.

Industries Depending on Plant Products. — 278. Method for the Investigation of the Aniline Derivatives and Other Foreign Colours in Wine. — 279. The Sugar Industry in Russia. — 280. The Utilisation of Milling Residues in Hungary. — 281. The Drying for Milling Purposes of Damp and Garlicky Wheat. — 282. The Refractive Index of Olive Oil and its Relation to Acidity and Rancidness.

Industries Depending on Animal Products. — 283. Cooling Hot-Bottled Pasteurised Milk by Forced Air.

Agricultural Products: Preserving, Packing, Transport, Trade. — 284. The Increasing Use of Forage Silos on Farms in the United States. — 285. Experiments Made in Germany on the Treatment and Use of Frozen Beef. — 286. Meal Production and Trade in the United States and other Countries. — 287. The Great Cattle Markets of the United States.

PLANT DISEASES.

I. — General Information.

Legislative and Administrative Measures for the Protection of Crops. — 288. Decree of the Italian Minister of Agriculture, Prohibiting the Export of Various Plants and Parts of Plants. — 289. The Phytopathological Inspection of Horticultoral and Vine-Growing Establishments Considered as a Factor of Increased Exportation, in France.

II. — Diseases not Due to Parasites or of Unknown Origin.

290. "False Blossom", a Disease of Cranberry (*Oxycoccus macrocarpus*) in the United States of America — 291. The Defective Development of Walnut Shells in Austria.

III. — Diseases Due to Fungi, Bacteria and Other Lower Plants.

Diseases of Various Crops. — 292. Host Plants of *Thielavia basicola*. — 293. *Chalaropsis thielavioides*, n. g., and n. sp. a Parasite of the White Lupin in Latium. — 294. *Solanum nigrum* and. *S. Dulcamara*, Host Plants of *Synchytrium endobioticum* (*Chrysophlyctis endobiotica*), in Great Britain.

IV. — Weeds and Parasitic Flowering Plants.

295. *Gomphocarpus fruticosus* and *G. physocarpus*, Naturalised Weeds in Queensland (Australia).

V. — Injurious Insects and Other Lower Animals.

Insects, etc., Injurious to Various Crops. — 296. *Microgaster glomeratus*, a Braconid Observed on Wheat, in Austria. — 297. *Cassida pallidula* ("Eggplant Tortoise Beetle"), Parasitic on the Eggplant and the Potato in Louisiana (U. S. A.). — 298. *Nezara viridula*, a Rhyncote Pest of the Tomato, the French Bean and the Potato in New South Wales. — 299. The Pear Leaf-Worm (*Gymnonychus californicus Mar.*), A Hymenopteron Injurious to the Leaves of the Pear Tree in the United States. — 300. *Lapeyresia molesta*, an Important New Insect Enemy of the Peach and of Other Fruit Trees in the United States. — 301. *Plectrodera scalator*, a Coleopteron Injuring *Populus deltoides* and *Salix alba*, in the United States.

VI. — Injurious Vertebrates.

302. Experiments Made in Austria in Protecting Forest Trees (especially Resinous Kinds) from Injury by Game.

FIRST PART.

ORIGINAL ARTICLES

The Organisation for the Prevention of Fraud in France

by MAXIME TOUBEAU.

Principal Divisional Inspector for the Prevention of Fraud.

Ten years ago a Department for the Prevention of Fraud was instituted in France. When the degree of development this Department has arrived at in ten years is seen, as well as the complexity of the tasks with which it is charged, one has the proof of what can be done in this country, as in others, when it is a question of changing ones former ways and of facing necessities long unheeded.

In 1906, when several States had taken measures against fraud (England, by the law of Aug. 11, 1876; Germany by that of May 14, 1879; Belgium by that of Aug. 4, 1890; Austria by that of Jan 16, 1898), France as yet possessed no State Department for detecting and proving commercial fraud and the adulteration of food stuffs. Offences of this nature were controlled by judicial authority if plaints were laid, according to common law, but without any kind of control similar to that in the above mentioned countries over goods exposed for sale in shops or markets. In certain departments, or rather in a few large towns (particularly at Paris), there were Laboratories and officials who watched over the products so as to assure, according to the municipal law of April 5, 1884, the quality and quantity and to prevent the sale of infected or injurious food stuffs, but excluding these purely departmental or municipal Departments, no comprehensive scheme was available. The Government remained aloof

from these beginnings, while each organisation had its special rules, and in most districts there was no such Department in existence.

The law of August 1, 1905, while repressing fraud more severely than in the past, gave the Government the power to regulate the sale of food stuffs, beverages, medicines, agricultural products, and to found a Department for sampling and analysis so as to control these goods. This law is of prime importance in the history of the new French organization for the repression of fraud. It has enabled France to gain the lost time in a few years, and to take a place – as M. TORTELLI said in 1909 (1) – at the head of the movement directed against an evil which had become, on account of the progress of chemistry, a real economic danger causing much disturbance.

The regulation of July 31, 1906, made in order to apply the law previously cited, is the first text that created in France a method of sampling and analysis and instituted a State service for the detection and proof of fraud with the cooperation of departments and communes. This regulation is still in force, and if it will be modified on certain points, because of additions made to the 1905 law by later laws, its essential principles seem definitely fixed. These principles are: By virtue of the 1906 regulation, samples may be taken at any time in warehouses, shops, trade vehicles, markets, fairs, market-places, and slaughter-houses in stations or ports of arrival or departure; the law of July 28, 1912, has added to this list, cellars, stables and, in general, all places of manufacture where products liable to inspection are kept in view of sale.

Four samples are taken at a time, sealed and sent to the Prefect of the Department. One sample is sent by the Prefect to the competent Laboratory, under a progressive number, to avoid any collusion between the chemist and the trader. If the result of the analysis is in favour of the dealer, he can claim compensation for the four samples. If the analysis shows intent to fraud, then the papers relating to the affair and the three samples are sent to the Public Prosecutor. This official can quash the process if he thinks that the presumption of fraud has insufficient foundation; on the other hand, he can send it to a court of justice when an expert deals with the subject of litigation: one of the three remaining samples is given to an expert chosen by the examining magistrate, another given to an expert chosen by the accused, the last is saved in case the two experts do not come to a mutual agreement. It is only when the expert for the prosecution has shown that there is fraud or falsification that the presumably guilty person is summoned before a competent court of law in order to be punished according to the law of August 1, 1905.

(1) Communication to the Italian Chemical Society, Milan Section.

These are the fundamental rules established in France by the decree of July 31, 1906 for the detection of fraud and falsification.

Before any legal intervention, this procedure necessitates the intervention of:

1) persons who take samples of the different objects subject to control (1);

2) Laboratories where the samples are analysed.

As regards the agents, the 1906 decree states that they may be appointed by giving power to police commissaries, special railway and dockyard police, market, fair and slaughter-house inspectors, custom house officers in the execution of their duties, borough or departmental officers approved by the Prefect. As regards the Laboratories, the 1906 decree only states that county and borough laboratories may be approved by the State, to work in cooperation with those of the State in the analysis of samples. No clause decides the organisation of the central Service, upon which the local administration should depend.

The provision of the law of August 1, 1905 and the decree of July 31, 1906 might have long remained a dead letter, as no vote of credit had been passed by Parliament to create this Department for the prevention of fraud. Work thus started with very limited resources. The difficult task was under the care of the Minister for Agriculture, at that time, M. RUAU. He asked M. E. ROUX D. Sc., now Director of the department, to study, under the title of Chief Inspector of Laboratories, the conditions under which the new department could work.

M. ROUX sought out, among the existing laboratories (municipal or county, agricultural stations), those that had such a staff and means which would enable them to analyse specimens of food stuffs and beverages as stated in the 1905 law. The list of these establishments was drawn up, with the conditions of their approval by the State. In addition, the sum allowable for the expense of analysis was calculated at the rate of 5 francs per sample analysed. All that remained to be done was to give the Prefects the necessary credit to cover the cost of sampling, which was

(1) In fact, these persons should only inspect beverages, food stuffs and agricultural products (seeds, manures, fungus remedies, etc.) in which it is most important to prevent fraud. It is only by exception and on special instructions or on complaint that they intervene for other matters, as the law of Aug. 1, 1906 gives them this power. — As for medical products, they are controlled by a special service: Inspection of Pharmacies (the samples are taken by Inspectors having a pharmacist's diploma and are analysed in Pharmaceutical Schools for that purpose).

first estimated at 2.50 francs per sample, but afterwards raised to 4.35 francs (1).

At the beginning of 1907, the Minister for Agriculture was able to give instructions to the Prefects, inviting each one to organise in his own department the Service for the prevention of fraud and to appoint officers for that purpose from amongst those competent, by virtue of the decree of July 31, 1906, to take samples. The share of samples to be taken was fixed at 1 per 1000 inhabitants, and as the cost of each sampling was then fixed at 7.50 fr. (5 for analysis, 2.50 for the rest), the credit allowed was based on this figure multiplied by the number of samples to be taken in each department, given the number of population. After January 18, 1907, the analytical methods to be used in the Laboratories for the analysis of food stuffs were published in the Official Journal; on February 18, 1907, 18 municipal or departmental Laboratories were accepted; finally, by the decree of April 24, 1907, the Central Service for the prevention of fraud, with M. ROUX as director, was officially recognised by the Ministry of Agriculture.

During the first working year 30720 samples of food or agricultural products were taken over all the territory by the 931 officials chosen by the Prefects (chiefly police commissaries); the proportion of samples pronounced suspect was 19.8 per cent.; numerous condemnations were obtained. The fraudulent knew that there was a control of goods in France and that they could no longer profit from the dislike of their victims for costly law suits to carry out their shameless and profitable speculations.

After the publication of the first results, Parliament showed great interest in the new Service, and voted the credits requisite to assure its development and to increase the number of samples taken. A decree of October 21, 1907 instituted, as a consequence, a body of 15 Inspectors under the Director of the service for the detection of fraud who were charged with technical inquiries and acted as a link between the Central Administration and the prefectoral Services for this purpose. Another decree of January 17, 1908 created a Central Laboratory for the prevention of fraud situated at Paris, with a staff of a Director, two chief chemists, ten

---

(1) The 4.35 francs are made up as follows:

Award to the officer	1.00 francs
Compensation for the samples	1.25 »
Other expenses	0.50 »
Travelling expenses	1.60 »
Total	4.35 francs

On adding the cost of analysis (say 5 fr.) we get the total of 9.35 fr., the cost estimated for each sample taken.

chemists, and four secretaries. This Laboratory has to carry out scientific researches in relation to the prevention of fraud, to give advice to the regional Laboratories in case they desire it, and to analyse part of the samples taken in the Parisian region, the other part being analysed by the Paris City Laboratory which was accepted for that purpose.

In consequence, this Department has increased both by the number of coopted Laboratories and by the number of its officials; on August 1, 1914, when war was declared, it included:

1) *Inspectors and officials for sampling:*

1 Chief Inspector
3 Chief divisional Inspectors
11 Divisional Inspectors } (decree of Oct. 21, 1907).

50 Departmental Inspectors (decree of Oct. 12, 1913).

82 Syndical agents (recognised by the Minister of Agriculture, according to article 65 of the Finance law of Feb. 27, 1907).

1000 local officials (variable number) chosen by the Prefect in each Department according to the decree of July 31, 1906 and particularly chosen from police commissaries; these officials receive the instructions of the Minister of Agriculture by the Prefects as intermediaries, while the Inspectors for the prevention of fraud are directly under the control of the Director of the Department.

2) *Laboratories that analyse the samples:*

Central Laboratory of the Ministry of Agriculture.
2 Laboratories of the Ministry of Finance.
1 Laboratory for the War Ministry (for the analysis of preserved foods).
1 Agricultural and horticultural Station.
3 Oenological Stations.
1 Seed testing Station.
1 Laboratory for the analysis of resinous products.
1 Research Laboratory, also for the control of hygienic and medical products.
20 Municipal Laboratories.
4 Departmental Laboratories.
23 Agricultural Stations.

Total 57 Establishments.

Amongst these Laboratories, only one has been founded: the Central Laboratory of the Ministry of Agriculture; the others were already in existence; they have been grouped and utilised for the prevention of fraud, which itself is now included in a much bigger department, that "of the Services Sanitaires et Scientifiques et de la Répression des fraudes", under the direction of M. E. Roux. The Laboratories have a regional standing as they only analyse samples taken in their own particular region; but some special Laboratories are available for the whole of France. Thus, samples of preserved foods are sent, no matter where they come from, to

the Laboratory for preserved foods of the War Ministry. Similarly, seed samples are sent to the seed-testing Station at Paris, and resinous products to the Laboratory for the analysis of resinous products at Bordeaux.

Each year the Minister of Agriculture divides out the credits necessary for the working of the sampling and analytical services. In 1913, sampling cost 242 403 fr. and analysis 206 935 fr.; in 1914 the estimated cost of sampling was 280 000 fr. and that of analysis 364 090 fr.; but because of the war they were reduced for economy to 180 000 and 290 000 francs.

The total credit for the Service for the detection of fraud is not high: in 1908 it was 909 500 fr., in 1909, 940 000 fr., in 1910, 1 090 000 fr., and 1913, 1 174 500 fr.

It is due to these expenses, relatively small for a large State, that the operations could be carried out that are summarised in the following table, taken from the report by the Deputy, M. DARIAC, on the budget for the Minister of Agriculture for 1914:

General Statistics of Sampling in France from 1907 to 1912.

Nature of the products sampled	Samples taken in 1907		Samples taken in 1908		Samples taken in 1909		Samples taken in 1910		Samples taken in 1911		Samples taken in 1912	
	Number	% of doubtful	Number	% of doubtful	Number	% of doubtful	Number	% of doubtful	Number	% of doubtful	Number	% of doubtful
Milk	8.106	35.4	17.504	21.5	22.434	21.2	22.801	20.2	25.851	21.5	25.630	[illegible]
Wine	5.795	17.9	10.911	17.7	12.487	17.1	15.994	19.8	17.694	23.6	18.720	[illegible]
Vinegar	492	25.6	849	15.2	753	11.9	672	10.4	722	12.6	643	[illegible]
Cider	406	16.9	794	27.2	905	18.0	1.131	15.2	1.364	16.7	961	[illegible]
Beer	347	21.9	726	8.0	975	1.5	945	2.2	1.038	0.8	746	[illegible]
Spirits	593	16.3	2.015	16.5	1.884	19.7	1.728	14.5	1.969	18.8	2.455	[illegible]
Butter	1.497	13.9	2 882	12.9	2.180	11.4	2.459	12.9	2.707	15.3	2.535	[illegible]
Oils	1.884	41.0	3.872	19.0	3.822	11.8	3.101	8.9	2.934	7.0	2.865	[illegible]
Seeds, cakes	—	—	1.991	12.2	2.030	7.8	1.764	9.2	1.743	8.3	1.520	[illegible]
Other products	11.600	8.0	26.182	7.6	24.574	6.7	24.843	5.8	24.396	4.5	24.344	[illegible]
Totals and averages	30.720	19.7	67.726	14.4	72 044	12.8	75.438	10.7	80.688	15.4	80.453	[illegible]

Resulting from the sampling, many persons have been found guil by the courts of law: 1188 in 1907; between four and five thousand each of the following years. The total of the fines paid into the treas has become higher than the credit allotted to the Service; in 1911 it reac 1 283 461 fr.; 1 483 671 fr. in 1912. In 1910, due to the discovery of con erable fiscal frauds together with a case of commercial fraud (water wine) the total of the fines reached 4 709 053 francs. These figures show t

he Service for the detection of fraud, as it is in France, is one of these rare dministrative Services that, instead of being a charge on the State, actually re remunerative.

Since the beginning of war, the Service has been very useful. The taff was much reduced by mobilisation and the number of samples taken as been reduced; some Laboratories have been closed, but the control f products and the search for defrauders has been continued vigorously: n 1914 the 50,000 samples taken lead to 3000 convictions; in 1915, the 5,589 samples led to 3137 convictions; and in the first half-year of 1916, ere were 22,744 samples and about 2000 convictions (figures that show no nsible increase of crime).

Since the war, the work the Service has been chiefly centred on food uffs of prime necessity and on the numerous products for the use of isoners or soldiers; juices or extracts of meat, invalid foods, loaves or scuits, water sterilisers, various hygienic products. The high price of rtain foods has lead to the production of many substitutes which have so been examined by the Service; products for producing cheap bever-ges, to replace the chicory grown in that part of the North of France cupied by the enemy. The officers of the Service have also applied w laws: that of March 12, 1915 on the prohibition of absinthe and such e drinks, that of April 25, 1916 on the revictualling of the civil popula-n with wheat and flour (only whole meal flour allowed to be made); ey also have to see the carrying out of the decrees fixing taxes or the ices of various products in the towns interested. Their vigilance is rticularly exercised in the war zone, as the Minister of Agriculture states a report to the President of the Republic inserted in the Official azette of April 1, 1916.

Since its foundation, the Service for the detection of fraud in France s continued to extend its scope; it has made possible the creation and plication of a new law (1); it has accustomed commerce to a necessary ntrol; the results of its intervention have been recognised as excellent; ud, that was increasing so rapidly, has been made difficult; the propor-n of samples found fraudulent by the Laboratories has decreased from

(1) The law of Aug. 1, 1905 on the prevention of fraud in the commerce of any ods was completed by the laws of Aug. 5, 1908 and July 28, 1912, as well as by a ies of regulations for public administration that has defined certain products (wines d spirits, beers, ciders, vinegars, syrups and liqueurs, meads, fats and oils, confectionary d chocolate, preserves of meat or legumes) or defined the limits of certain regions ine-producing regions of Champagne, Banyuls, Bordeaux, Brandies of Cognac, Arma-ac). The officers of the Service are of course responsable for the application of these gulations.

19.7 per cent. in 1907, to 14.4 per cent. after the second working year of the Service, and was 14.7 per cent. in 1912, because the samples were taken by more expert officers from products judged from good knowledge to be abnormal at the time of sampling. Finally, since the war, the Service has constituted a safeguard against the enterprises of unscrupulous traders, with the aid of the honest traders that form the immense majority and who have shown, like all other classes in France, the purest patriotism during the present great crisis.

SECOND PART.

ABSTRACTS

AGRICULTURAL INTELLIGENCE

GENERAL INFORMATION.

14 - **Appropriations of the Federal Department of Agriculture of the United States for the Fiscal Year Ending June 30, 1917,** in *Experiment Station Record*, Vol. 35, No. 4, pp. 301–310, Washington, September 1916.

The appropriations carried in the last act covering the fiscal year nding June 30, 1917 aggregate $ 26 948 852.

This is an increase of $ 2 349 763 over the estimates submitted by he Department and an increase of $ 3 977 070 over the amount carried n the act for the previous year.

Out of the allotments to the various Bureaus of the Federal Department of Agricul- re, the Weather Bureau receives $ 1 747 200.

The appropriations directly allotted to the Bureau of Animal Industry aggregate 3 020 746, but this is supplemented by extensive funds provided elsewhere.

The inspection and quarantine work of the Bureau against animal diseases receives 532 780, a decrease of $ 75 000 due to the reduced area under quarantine for sheep l cattle scabies. For pathological studies of animal diseases $ 138 020 is granted, of ich $ 50 000 is a new item authorizing work on contagious abortion. For the tick-era- ation campaign an appropriation of $ 632 400 is given, and it is expected that this will be plemented by State and county funds sufficient to make a total of nearly $ 1 000 000.

The act carries $ 360 000 to continue the hog-cholera work, of which $ 175 000 y be used for the enforcement of the virus-serum-toxin act, and $ 35 000 for research. allotment of $ 75 000 is also made for the investigation, treatment, and eradication dourine.

The eradication of foot-and-mouth disease is followed by a reduction in the emergency propriation for this and similer diseases, from $ 2 500 000 to $ 1 250 000, plus the

unexpended balance of $ 655 790 93 from the previous year. The meat-inspection work is continued much as at present, a permanent appropriation of $ 3 000 000 per annum being augmented by a supplementary allotment of $ 344 500.

A net increase of $ 27 620 is provided for the encouragement of dairying and one of $ 19 260 for that of animal husbandry, making $ 277 470 and $ 208 320, respectively, available for these purposes. It is planned to extend especially the studies in dairy farming, dairy research, the milk and cheese investigations and demonstrations, and the studies of pork production, Shorthorn cattle breeding, poultry breeding, range sheep breeding and management, and the classification of wools.

A special appropriation of $ 60 000 is continued for the work in live-stock production in the cane-sugar and cotton districts, now being conducted in close cooperation with the State of Louisiana. This State has deeded to the Department a farm of about 500 acres at New Iberia, and this farm has been divided into four tracts for work with horses and mules, beef cattle, dairy cattle and hogs, and hogs alone. A large number of demonstrations and other extension work in animal production and dairying are also under way. Somewhat similar work is contemplated under a new appropriation of $ 40 000 for experiments in dairying and live-stock production in semiarid and irrigated districts of the Western States.

The Bureau of Plant Industry receives an increase from $ 2 139 150 to $ 2 537 120, its appropriation being divided as usual among a large number of projects. Among the most important new items is that allotting $ 250 000 for continuing the campaign against the highly infectious disease known as citrus canker. Another large increase is that of $ 30 000 for studies of white-pine blister rust and other epidemic tree diseases.

Other extensions of work provided for include $ 6 500 for studies of tobacco diseases, $ 5 000 for citrus and subtropical fruit diseases and a like amount for breeding disease-resistant citrus varieties, $ 2 500 for carrying on soil studies in connection with the powdery scab of potato, $ 5 000 for extension work in cotton growing and $ 3 000 for cotton diseases, $ 5 000 for the development of work on plant-infesting nematodes, $ 8 350 for establishing a new grain standardization laboratory in Minnesota, $ 7 500 for studies on the handling, grading, and transportation of the grain sorghums, $ 7 500 for studies of the water requirements of crops in the irrigated regions, $ 22 500 for investigations of black rust and stripe rust of wheat, oats, and barley, and other cereal diseases, $ 10 000 for the development of an American sugar-beet seed industry, and $ 21 000 to extend and develop the forage-crop investigations and provide for the more effective distribution of new and rare varieties of seeds.

The congressional seed distribution is continued on the usual basis with an allotment of $ 252 540.

The allotments for the Forest Service, as usual, far exceed those for any other bureau. The aggregate is $ 8 549 735 but $ 3 000 000 of this sum is for additional purchases under the Appalachian Forest Reserve Act, $ 2 000 000 of which is not available until July 1, 1917. An appropriation of $ 100 000 is also continued for cooperation in the States in fire protection work under the same act.

The appropriation for the Bureau of Chemistry aggregates $ 1 153 801 of which over half is for the enforcement of the Food and Drugs Act. The purchase and equipment of a travelling laboratory at a cost of $ 7 500 is authorized.

The various lines of work under way are continued without change and $ 50 000 added for studies of the utilization for colouring purposes of raw domestic materials, more particularly with reference to their use in food products. The studies of naval stores will

also definitely assigned to the Bureau of Chemistry and $ 5 000 additional was granted to carry on demonstrations of improved methods for preparing these commodities.

The Bureau of Soils is granted $ 175 000 for experiments and demonstrations to determine the best methods of obtaining potash on a commercial scale. The remaining lines of work of the Bureau are continued unchanged, the total appropriation being $ 503 735.

An increase of $ 38 980 is accorded the Bureau of Entomology. This is divided among a number of projects, including extension work in bee culture, and studies of the grape-berry moth, clover seed midge, clover root borer, tobacco hornworm, insects instrumental in the carriage of cucumber diseases and biting flies and other insects affecting the health of domestic animals. The gipsy and brown-tail moth campaign is allotted $ 305 050 and the Bureau as a whole $ 868 880.

The Bureau of Biological Survey is granted $ 578 230. The principal change is an increase of $ 125 000 to be used on the public lands, National Forests, and elsewhere in the Western and Northwestern States to combat the spread of rabies by destroying wolves, coyotes, and other predatory wild animals.

This appropriation followed a serious outbreak of the disease in these States, in which serious losses to live stock and even human cases of the disease resulted from an epidemic among coyotes, and continues work begun earlier in the year under a deficiency appropriation of $ 75 000.

The total appropriation for the States Relations Service is $ 2 969 680, as compared with $ 2 821 840 for the previous year. The main item of increase is one of $ 100 000 for the farmers, cooperative demonstration work outside the cotton belt. This will permit of considerable further extension of that work and of initiating in a small way extension work by women county agents. There is also an increase of $ 23 000 for the experiment stations in Alaska, Hawaii and Porto Rico. The other lines of work, including the maintenance of the State experiment stations, the farmers' cooperative demonstration work in the cotton belt, the study of famers' institutes and agricultural schools, and the investigation in home economics are continued on the existing basis.

The funds allotted to the Office of Markets and Rural Organization are nearly doubled, the total of $ 872 590 allowing for a considerable expansion in its work. During the crop season of 1915 an experimental new service was conducted giving timely information on the movements and prices of the strawberry, tomato, cantaloup, and peach crops, with such successful results that $ 136 600 is now provided for systematic service in the collection and distribution of market news by telegraph for perishable fruits and vegetables and by mail for oter farm products.

Other new items are $ 65 000 for the gathering of information pertaining to the marketing of live stock and its products and $ 35 000 for cooperation with the States in marketing studies. An increase from $ 238 000 to $ 285 000 is granted for other marketing and distribution studies, notably for additional attention to cooperative purchasing and marketing, market grades and standards, marketing business practice, and the marketing of live stock, meats, animal by-products, dairy products, grain, seeds and hay. The Office also receives $ 48 000 to continue the cotton-standardization work and $ 32 860 for its studies in rural organization.

An increase from $ 50 000 to $ 75 000 is provided for the enforcement of the plant-quarantine act by the Federal Horticultural Board. Of this sum $ 15 000 is to be used to prevent the introduction of the pink bollworm, one of the most serious cotton pests

known, and $ 10 000 for the inspection of the imported potatoes to guard against potato wart and other diseases and insect pests.

The work of the remaining branches of the Department is continued on substantially the present basis, both as to funds and lines of work.

The Bureau of Crop Estimates receives $ 316 436, an increase of $ 32 956, mainly for the employment of additional field agents and specialists, notably in truck and fruit crops. The Office of Public Roads and Rural Engineering is granted $ 599 200, an increase of $ 12 735; the Office of the Secretary $ 688 160, of which $ 285 810 is for the Office of Farm Management; the Division of Accounts and Disbursements $ 44 920; the Division of Publications $ 197 650; and the Library $ 49 520.

The Department is again allotted $ 105 000 for the enforcement of the insecticide act, $ 40 000 to continue demonstration work on reclamation projects, and $ 123 689 for rent of buildings in the District of Columbia, and receives $ 122 500 for miscellaneous expenses.

The three noteworthy measures appended to the main portion of the act, designated respectively as the United States Cotton-Futures Act, the United States Grain Standards Act and the United States Warehouse Act are designed to alleviate some of the difficulties which have frequently confronted farmers in the marketing of the staple agricultural crops. The United States Cotton Futures Act as reenacted, follows substantially the text of the act passed in 1914. That measure was a taxing statute designed to regulate future trading in cotton; it imposed a tax at the rate of two cents per pound on all contracts of sale of cotton for future delivery entered into on exchanges and like institutions, unless such contracts complied with certain conditions which were calculated to eliminate certain recognized evils in future dealings.

The United States Grain-Standards Act authorizes the Secretary of Agriculture to investigate the handling and grading of grain, establish official standards, license grain inspectors and otherwise administer its provisions.

The central purpose of the United States Warehouse Act is to establish a form of warehouse receipt for cotton, grain, wool, tobacco, and flaxseed which will make these receipts easily and widely negotiable as delivery orders or a collateral for loans, and therefore of definite assistance in financing crops.

The funds administered by the Department of Agriculture but appropriated in other ways aggregate $ 10 604 000, the largest items being those of $ 5 000 000 for the construction of rural post roads, $ 3 000 000 for meat inspection, $ 1 589 000 under the Smith-Lever Extension Act, the remainder being chiefly for payments to the States as their quota of the receipts from the National Forests. There is also the appropriation for the Department printing and binding, carried as usual in the appropriation act for sundry civil expenses. This appropriation has been increased from $ 500 000 to $ 600 000, of which $ 47 000 is for the Weather Bureau and $ 177 500 as increase of $ 40 000 for use in the pubblication of Farmers' Bulletins.

The federal appropriations for agricultural purposes are not confined to the Department of Agriculture. The usual large appropriations will be available for agricultural education in the land grant colleges under the Morris and Nelson Acts, as well as the smaller grants for the rural education work at the Bureau of Education, demonstration, work among the Indians and the payment of the country's quota toward the support of the International Institute of Agriculture.

Besides the aid granted under the Federal Farm Loan Act, a provision is also carried in the National Defence Act of June 3, 1916, for an investigation of means for the production of nitrates and other products for munitions of war and useful in the manufacture of fertilizers, and for the construction and operation by the Government of a plant or plants to manufacture these products. This enterprise carries an appropriation of $ 20 000 000.

The substantial aid tendered to agriculture in these various ways indicates anew the increasing popular realization of the responsibility of the Federal Government in the development of the Nation's basic industry.

15 — **The Distribution of Crops and Farm Animals in the United States.** — FLOWER, P. W. in *The Field*, Vol. XXVI, No. 12, p. 1031, New York, December 1916.

The following table gives the acreage devoted to the chief crops in the different States of the Union and the distribution of cattle, horses mules, swine and sheep. It was compiled by the writer, at the request of the Taylor-Critchfield-Clayne Company from the official statistics of the United States Department of Agriculture. The table shows how the various States compare as to crops and live-stock.

Thus, while New York is 1st in hay and in number of dairy cows, it is 25th in wheat, 26th in maize and 27th in number of swine.

On the other hand, Texas is first in cotton, 2nd in rice, 3rd in maize etc., but 1st in number of beef cattle and mules, and 3rd in horse-breeding.

In this table, the letters (*a*), (*b*), (*c*), (*d*) are used in the order of their importance when the crop acreage, or the number of stock, are approximately equal. Thus the States of Missouri and Nebraska are tied for the 4th place in maize, but the acreage under this crop is a little larger in the former than in the latter State. This is expressed by the symbols 4 (*a*) and 4 (*b*).

How Crops and Farm Animals are Distributed in the United States.

Districts and States	Crops											Farm Animals					
	Maize	Wheat	Hay	Oats	Rye	Barley	Flax	Buck-wheat	Cotton	Tobacco	Rice	Dairy cows	Other cows	Horses	Swine	Sheep	
New England:																	
Maine	42	37	14	32	—	23 (*a*)	—	8	—	—	—	33	40	36	39	35	—
New Hampshire	39 (*a*)	—	26	41	—	24	—	17 (*c*)	—	22 (*a*)	—	40	43	43	44	41	—
Vermont	35	38	15 (*a*)	35	29 (*c*)	19 (*b*)	—	11	—	22 (*b*)	—	25	33	38	37	39	—
Massachusetts	34	—	27	42 (*b*)	27 (*a*)	—	—	16	—	13	—	34	41	41	38 (*a*)	44	—
Rhode Island	43	—	44	45	—	—	—	—	—	—	—	46	44	46	46	47	—
Connecticut	32	—	33	40 (*b*)	24	—	—	15 (*a*)	—	9	—	38	42	44	43	45	—
Middle Atlantic:																	
New York	26	25	1	14	7 (*a*)	12 (*b*)	—	1	—	14	—	1	14	15	27	20	32 (*d*)
New Jersey	28	34	35	36	10	—	—	10 (*a*)	—	—	—	35	45	37	36	43	32 (*e*)
Pennsylvania	22	13	2	13	4	12 (*d*)	—	2	—	8	—	7	23	16	22	19	19
East North Central:																	
Ohio	11	11	5	8	8	17	—	7	—	4	—	8	16	7	6	5	22
Indiana	6	8	10	10	7 (*b*)	21 (*a*)	—	13	—	11	—	12	20	9	5	17	16
Illinois	1	7	9	2	14	14	—	14	—	18	—	6	8	2	2	18	13
Michigan	21	16	8	11	2	12 (*a*)	—	3	—	—	—	9	19	14	20	10	32 (*d*)
Wisconsin	20	30	6	6	1	5	7 (*a*)	6	—	7	—	2	7	13	10	23	33 (*a*)
West North Central:																	
Minnesota	16 (*a*)	3	13	3	3	3	2	12 (*a*)	—	—	—	4	9	8	12	27	31 (*a*)
Iowa	2	28	3	1	12	0	0	12 (*b*)	—	—	—	3	2	1	1	15	20
Missouri	4 (*a*)	9	4	16	16	21 (*c*)	8	15 (*c*)	12	10	10 (*b*)	10	6	5	3	14	2
North Dakota	25	2	25	4	6	1	1	—	—	—	—	21	24	10	28	30	29
South Dakota	10	11	11	21	25	26 (*a*)											

District of Columbia	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Virginia	19	15	22	29	11	—	—	5	13	3	—	23	32 (a)	20 (b)	23	22	18	
West Virginia	23 (b)	27	21	33 (b)	19	—	—	4	—	12	—	28	37	28	30	21	27	
North Carolina	15	17	34	24	13 (a)	19 (c)	—	10 (b)	8	2	10 (a)	24	36	30	14	34	11	
South Carolina	18	32	40	19	27 (d)	—	—	—	5	6	5	31	39	39	26	42	12	
Georgia	7	26	37	17	20 (b)	—	—	—	2	17	7	—	22	35	9	36	3	
Florida	23 (a)	—	45	37	—	—	—	—	11	15	8	37 (d)	18	42	24	38 (a)	21	
East South Central:																		
Kentucky	10	20 (b)	17	31	16 (a)	22 (a)	—	—	—	1	—	18	25	18	13	16	10	
Tennessee	13	19	16	21	18	22 (b)	—	15 (d)	10	5	—	22	30	21	18	24	7	
Alabama	9	33	38 (a)	18 (a)	26	—	—	—	3	21 (b)	9	20	28	32	11	38 (b)	5	
Mississippi	12	—	38 (c)	27	—	—	—	—	4	—	6	17	27	26	15	32	4	
West South Central:																		
Arkansas	16 (b)	29	36	20	20 (a)	—	—	—	6	19	3	19	29	24	16	37	9	
Louisiana	17	—	38 (b)	33 (a)	—	—	—	—	9	20	1	27	31	29	17	31	14	
Oklahoma	8	6	30	12	25	21 (c)	—	—	7	—	—	15	10	12	19	40	6	
Texas	3	12	29	15	28	20	—	—	1	21 (a)	2	5	1	3	7	8	1	
Mountain:																		
Montana	31	14	20	18 (b)	21	13	3	—	—	—	—	36	15	19	34	2	—	
Idaho	39 (b)	21	23	22	27 (c)	8	—	—	—	—	—	37 (a)	35	25	32	4	32 (a)	
Wyoming	38	31 (a)	25	28	22	18	9	—	—	—	—	43	21	31	41	1	34 (a)	
Colorado	27	23	15 (b)	25	15	10 (a)	10	—	—	—	—	29	11	20 (a)	33	12	24	
New Mexico	30	35	41	38	—	21 (b)	—	—	—	—	—	41	12	27	40	3	25	
Arizona	40	36	42	42 (a)	—	16	—	—	—	—	—	42	17	34	45 (b)	11	30	
Utah	41	28	31	34	20 (a)	15	—	—	—	—	—	39	34	33	38 (b)	9	34 (b)	
Nevada	44	35	39	40 (a)	—	19 (a)	—	—	—	—	—	45	32 (b)	40	45 (a)	13	33 (b)	
Pacific:																		
Washington	36	10	19	26	23 (a)	9	—	—	—	—	—	26	38	22	35	26	26 (b)	
Oregon	37	20 (a)	18	23	17	10 (b)	—	—	—	—	—	30	26	23	29	6	28	
California	33	24	7	30	23 (b)	2	—	—	14	—	4	14	5	17	25	7	17	
All other States	—	—	—	—	—	—	—	—	14	—	—	—	—	—	—	—	—	

216 — **Pigs and the Spread of the Ectoparasites of Man in Tropical Regions.** — ROUBAUD, E., in *Bulletin de la Société de Pathologie Exotique*, Vol. IX, No. 10, pp. 768-771. Paris, 1916.

In the course of researches on *Auchmeromyia* (*Bulletin Scientifique de la Société de France et de Belgique*, Vol. XLVII, 2, June 24, 1913; *Etudes sur la faune parasitaire de l'Afrique occidentale française*, I, Paris, Larose, 1914) the writer has shown the relationship existing, from the point of view of the blood sucking *Calliphora* larvae, between man and certain types of bare-skinned mammals living in holes, such as the genera *Phacochaerus* (pigs common in tropical Africa) and *Orycteropus* (Edentates). The writer has shown that the *Cheromyia* of the burrows of *Phacochaerus*, whose blood it sucks, is closely related to the *Auchmeromyia* of man; these two larvae can be experimentally reared on both pig and man. In addition, the Author has shown with BOUET (*Bulletin de la Société de Pathologie exotique*, Vol. IX, No. 4, April 12, 1916) that *Cheromyia* is also found in houses, apparently for ovipositing there. These investigations have shown the close relationship that exists, as regards the nutrition of ectoparasites, between man and bare-skinned mammals, particularly pigs. The writer gives other instances, all tending to show the importance of this idea, which up to now was purely theoretical.

In the burrows of *Phacochaerus* in Rhodesia, LLOYD has found the tick of man, *Ornithodorus moubata* (which transmits African tick fever) in a region far from any village and where the tick was not known by the natives. WELLMANN has seen the tick in pig-styes in Angola, and R. VAN SAGEGHEM has observed a similar fact in the Zambi district (Belgian Lower Congo). Again, in Mexico, an Argas, *O. turicata* attacks both man and pig.

The Jigger flea (*Sarcopsylla penetrans*) of man bears the characteristic name of *bicho de porco* in certain regions of Brazil. VAN SAGEGHEM has found it on the pig at Zambi, and BLANCHARD has found it on the pig in Liberia.

The Portuguese Mission for the study of sleeping sickness in Prince's Island (Gulf of Guinea) has shown in its final Report (*Arquivos de Hygiene e Pathologia exoticas*, Vol. V, March 30, 1915) the close association existing in the Island between the pigs and the tsetse fly (*Glossina palpalis*). The fly attacked in large numbers the herds of half-wild pigs originated from the domestic races introduced into the island; the systematic destruction of the wild pigs, together with direct measures for destroying the tsetse flies, has soon brought about its disappearance. Moreover, MOISET (*Bulletin of Entomological Research*, 1913) has proved that *Phacochaerus* is abundant in places where *Glossina tachinoides* breeds.

It thus seems justifiable to think that many other habitual or occasional ectoparasites of man can use wild or domesticated pigs as supplementar

or preferential hosts, or inversely. The *Sarcoptes* causing mange in the pig is easily transmitted to man, though no other host is known. That of the goat passes equally to man or to the pig. In his researches on exanthematic typhus, NÖLLER (*Berliner Klinische Wochenschrift*, July 10, 1916) has found that the pig louse can live for a long time on man, and that inversely the human clothes louse (*Pediculus vestimenti*) can live on the pig for more than seven days.

According to this mass of converging evidence, pigs are nearest to man as regards the possibility of nourishing ectoparasites. Thus there is no doubt that these ectoparasites, common to both pig and man, are the possible agents for transmitting serious tropical diseases. This is known to be a fact for certain pathogenic trypanosomes (*Trypanosoma dimorphon, Tr. pecandi, Tr. rhodiense* in particular), so researches should be elaborated on these lines.

217 — **The First 37 Years of the Royal Hungarian School for "Maitres d'eau" at Kassa (1879-1916).** — ROHRINGER, S., in *Vizügyi Közlemények* (*Bulletin of Hydraulics*), Year VI, Part 5, pp. 148-158, 6 illustrations. Budapest, September-October 1916.

History of the School. — At the time when the engineering institute for agricultural hydraulics commenced to work in Hungary, it was urgently required to form an auxiliary staff having the special knowledge required for carrying out hydraulic work. In 1879, on the initiative of Baron GABRIEL DE KERMÉNY, Minister of Agriculture, the creation of the first course for "maitres d'eau" was inaugurated on December 1, of the same year with 9 students in the building of the Kassa Agricultural Institute under the direction of the head of that Institute.

Three winter sessions, each of four months made up the course; while 3 Professors of the Institute and 2 hydraulic agricultural engineers were charged with the teaching. The first students were mostly former non-commissioned officers from a military engineering corps, that is, adults capable of being employed practically after the winter course.

In 1884, on ground belonging to the agricultural Institute, a special building was erected where the Bureau of Agricultural Hydraulics, formerly in charge of the School, was installed, and the teaching then largely fell to the engineers of this Bureau. The general tendency of soil improvement work makes it probable that the recruiting of a sufficient number of "maitres d'eau" will require the permanent upkeep of the School. In 1887, the first regulation was suspended and parallel classes were started to train a sufficient number of students so as to provide for the works undertaken by the bureaux. This regulation was modified in 1890, because, the water service having been centred at the Ministry of Agriculture, it became also necessary to appoint River Boards officers and to improve the

instruction of the guardians of dams and embankments in the service of the Water Companies. Therefore the Minister of Agriculture allowed such persons to be admitted to the School, as long as the buildings had space enough.

The increase of the staff of the Bureau, of the collections and tools of the School and Bureau made it necessary to erect (in 1908) a new building, sufficiently large to accomodate 60 to 75 students. This building it cost 265,217 *Kronen* (1) and the teaching material is valued at 30,000 *Kronen*, which increases every year because of the continual acquisition of books, instruments, etc.

Up to the present, the School has had a total of 481 students, of which 97 were admitted in 1879–1889, 162 in 1889–1899, 113 in 1899–1909, and 109 in 1909 to 1914. Out of the 481 students 383 (79 %) completed their studies and obtained the certificate, while 21 % did not finish the course.

Practical Instruction. — The School, under the Minister of Agriculture, has to train exclusively the technical assistants attached to the Bureau for Agricultural Hydraulics, the River Boards and the Water Companies. These assistants should be able to help in soil improvement work, defence against floods and to act as water-policemen. Thus the Bureau trains these " maitres d'eau " primarily for State service. Candidates admitted for State services are taught and maintained without charge. It is only if places are available and on payment that technical employes of Water Companies or large estates are admitted.

The instruction is spread over 3 winter courses of 4 months each (Dec. 1 to April 1): in the interval the national Direction of the Water Department sends the candidates to various posts where they pass the summer performing the usual duties and carrying out easy operations.

The conditions of admission are, besides that of Hungarian nationality: the certificate of 2 classes at a secondary school or the rank of non-commissioned officer; age between 18 and 30 years; perfect knowledge of the Hungarian language. Non-commissioned officers from the army reserve of engineer corps and those that have carried out industrial work similar to that for the Water Service are given the preference for admission.

The annual budget of the School was, before the war, 26,000 *Kronen* including the cost of feeding internal students, lighting, heating, medical attendance, drawing instruments, books, etc. The State pays about 1200 *Kronen* for each pupil; in exchange the pupils already give useful service at the end of the first year and further are bound to serve the State for 3 years after leaving the School, or alternatively to pay an indemnity of

(1) 1 gold *Krone* = 10 *d. at par.* (Ed.).

1000 *Kronen* as a part return for the cost of their education. Those students that successfully complete their studies receive the diploma of " maitre d'eau " of the State Hydraulic Department.

218 - **The Foundation of a National School of Veterinary Medicine in Mexico.** — I. Decree for organising veterinary instruction, in *Boletín de la Dirección de Agricultura, Secretaría de Fomento, Colonización e Industria*, Year II, No. 1, pp. 9-10. Mexico, July, 1916. — II. Inauguration of the National School of Veterinary Medicine. *Ibid*, pp. 10-12.

By the decree of April 11, 1916, General VENUSTIANO CARRANZA has founded in Mexico a National School of Agriculture independent of the School of Agriculture. To be admitted, it is necessary to have taken the secondary education in an officially authorized school.

The course lasts four years. The school commenced work May 5, 1916.

219 - **The Activity, During the Agricultural Season 1914-1915, of the Various Technical Branches of the Agricultural Administration of Tunis.** — *Bulletin Mensuel de la Direction générale de l'Agriculture, du Commerce, et de la Colonisation de la Régence de Tunis*, Year 20, No. 88, pp. 145-167. Tunis, 1916.

I. — BOTANICAL BRANCH - A. Cereals. — Comparative studies have been carried out on 22 varieties of hard wheat which were grown over 6.40 hectares (= 15.8 acres): the yields per hectare for the varieties tested were:

Turgid or Rivet wheat (*Triticum turgidum*)	Derbessi ap 1	7	quintals per hectare (1)
	» ac 1	6	
	» ac 2	4	
	Kealforte	4	
True hard wheats (*Triticum durum*)	Adjini ac 2	9	
	Sbei smooth tall	6	
	Sbei pubescent tall	6	
	Mahmoudi ap 4	7.85	
	» ac 2	5.82	
	» ac 3	9	
	Biskri smooth ac 2	9.70	
	Agili pubescent	7.17	
	Souri ac 10	10	
	Souri ac 4	9.10	
	Mekki ac 2	9	
	Hamira ac 4	5.75	
	» ac 5	11	
	Medéa	12	
	Azizi	12	
	Jenah - Rhetifa ap 2	17	
	Taganrock	8.65	
	Wheat No. 24	24.94	

(1) 1 quintal per hectare = 89.2 lbs. per acre.

Wheat No. 24 gave good results the year before, in spite of the drought; its defect is having the grain of a dull-grey colour.

Agriculturists received 3 300 kg. of seed, though 8 100 were asked for.

In addition, the pedigree cultivation has been undertaken of 20 new types of hard wheats representing unstudied Tunisian forms or coming from abroad, or new varieties found in the field and tested in the hope of finding the degree of fixity. For several years the influence of the size of the seed has been studied. In 1915, the following results were obtained:

		Yield per hectare: Grain and straw	Yield per hectare: Grain alone	Ratio Grain: total yield
Mahmoudi ap. 4	large seeds	5 600 kg.	780 kg.	0.139
	small seeds	4 400	760	0.172
Taganrok	large seeds	4 850	850	0.175
	small seeds	4 530	880	0.194

It is concluded that the influence of the size of the seed on the yield is very small.

Similar experiments were carried out on 3 varieties of ' weak ' wheats. The results were:

		Yield per hectare: Grain and straw	Yield per hectare: Grain alone	Ratio Grain: total yield	Average yield of grain per hectare
Richelle early 110 *c*	large grains (1.37 ha.)	8 737 kg.	2 628 kg.	0.300	2 139 kg.
	small grains (0.75 ha.)	2 800	1 246	0.455	
Richelle late 109 *b*	large grains (1.10 ha.)	3 890	1 135	0.292	956
	small grains (0.50 ha.)	2 100	560	0.267	
Mahow wheat 124 *a*	large grains (1.25 ha.)	5 420	1 446	0.266	990
	small grains (1.37 ha.)	1 770	467	0.264	

The Tunisian agriculturists receved 7 000 kg. of ' weak ' seed wheat, 9 400 kg. having been asked for. Twelve ' weak ' wheats were studied for pedigree. 10.95 hectares were sown for the production of seed barley, and 2 200 kg. of seed barley were distributed to the farmers, 5 100 kg. being asked for. Twenty-nine samples of oats of very varied origin, cultivated to find a dark coloured oat often appearing in Tunis, were studied for pedigree.

B. Forage Crops. — In particular, 4 varieties of forage peas coming from Svalöf Station (Sweden) were studied as they seemed of interest for Tunis; also two varieties of vetch from Svalöf, which were drought-resistant in 1914 and cropped well in 1915. A number of lucerne were collected from different countries: Argentine Republic (Rio Negro Hungaro, La Pampa, Villarmo), Sweden (Svalöf), Greece (lucerne specially for dry soils), France and Peru; they gave good results.

A large number of native or foreign Gramineae and Leguminosae have been tested. In 1914, there were sown: 58 Tunisian Leguminosae, 140 Gramineae and 429 samples of leguminosae received from Botanical Gardens and Agricultural Stations all over the world.

C. Cotton. — The varieties tested gave the following results:

	Varieties	Raw Cotton per are	Ratio Cotton fibre : yield
Egyptian varieties	Assil (41 ares) (1)	8.732 kg.	0.30
	Mt Afifi (35 ares)	8	0.30
	Abassi	—	0.30
	Janovitch	—	0.30
	Sakallaridés	—	0.31
Sicilian varieties	Biancavilla, white (9 ares)	8.029	0.21
	Biancavilla, red	—	0.20
American varieties	Mississipi	—	0.24
	King	—	0.27
	No. 3	—	0.29
	No. 14	—	0.24
	No. 10	—	0.29
	No. 17	—	0.25
	No. 25	—	0.30
Varieties from Turkestan	No. 2, white seeds (4 ares)	7.180	0.28
	No. 3, green seeds (10 ares)	8.485	0,24
	No. 3, white seeds (8 ares)	8.184	0.25
	No. 4, bare seeds	—	0.27

For the present the selection and separation of pure lines have had to be suspended.

II. — Southern Experimental Gardens. — At the Experimental Garden at Gabes, fruit-bearing trees have been largely studied, especially as regards varieties and graft-bearers. Among other results, success has been attained with plantations of almonds, limes, olives (Zarazzi and Chemlali varieties). For the vine, it would be interesting to introduce varieties giving grapes for drying. The banana trials were very encouraging; but the musk variety from the Hama Experimental Garden (Algiers) has not as yet given the results expected of it.

At the same Experimental Garden studies were undertaken on varieties of potato for introduction in that region: the following varieties are recommended: Institut de Beauvais, Richter's Imperator, Blanche d'Italie and Saucisse rouge du Nord (also called Saucisse rouge d'Orléans).

In the *Sfax Experimental Garden* have been planted many fruit-trees: almond, peach, apricot, pistachio, carob, Japanese medlar-trees, etc.,

(1) 1 are = $\frac{1}{100}$ th part of an hectare or 119.6 sq. yds. (*Ed.*)

belonging to various varieties. In addition a small vineyard of some 120 feet has been planted with 40 varieties of table grape. The Garden has sold 2 000 almond-trees, 250 pear-trees, 150 apple-trees, 150 peach-trees and nectarines, 25 plum-trees, 150 carob-trees in pots and 50 pistachio-trees in pots. Most of the almond-trees were delivered to European colonists; on the other hand, the natives appear most interested in early varieties of peach, pear and apple-trees from the Experimental Garden.

CROPS AND CULTIVATION.

220 — **Effect of Meteorological Factors on the Germination Capacity of Seeds.** — WALIDEN, J. N., in *Sveriges Utsädesförenings Tidskrift*, Year XXVI, No. 4, pp. 146–162, 4 fig. Malmö, 1916.

It is necessary, in the present article, to bear in mind what the writer understands by " germination capacity ". It is quite possible that seeds possessing high germinating power and strong germinating energy may, after germinating perfectly normally, later show evident symptoms of weakness with various checks and defects of growth.

When the writer speaks of a seed germinating well, he means to convey not only the fact that it develops rapidly and regularly but also produces sturdy seedlings.

Meteorological variations at the time of maturation of the seeds have a very evident effect on the germination capacity. Copious rain and a low temperature during the period of ripening and harvest stimulate the development of the grain, which subsequently germinates in storage or even in the shock. The degree of sensitiveness varies according to the species but is maximum in rye, which two days rain are sufficient to germinate. For wheat, barley, oats, marked differences are noted between different varieties. Among the most sensitive varieties of wheat may be cited Wilhelmina, Extra-Squarehead I and especially Pudel; Extra-Squarehead III, Sol, Bore and Grenadier, on the other hand, are much more resistant. Among the most sensitive varieties of barley are Svanhals and Gull; among the least sensitive Prinzess, Chevalier, Primus and Hannchen.

Analogous differences are observed between the various kinds of oats: in cases of excessive rain at the time of harvest Gullregn, Ligow and Klock even sprout in the ear, while Krom, Seger, Bortslös, Probsteier and Stormogul resist much longer.

Premature germination naturally influences the germinating capacity as understood in the wider sense; grains which have begun to germinate in the ear only continue with difficulty at seeding time and at the best of times only produce weak and malformed seedlings.

If rain is a determining factor, the question arises whether the tendency to early development is influenced by the meteorological factors predominating at the time of harvest. The answer is in the affirmative; grains formed during dry weather germinate better than those formed during rain. The point is that in the latter case the seeds are not properly ripe when harvested.

In July 1914 (the ripening period in Southern Sweden) there were only 57.1 mm. of rain (in 9 wet days) and there were 221 hours of sunshine with average daily temperature of 23° C. The month was therefore a dry and hot one. On the other hand, in 1915, the data were as follows: 114.1 mm. distributed over 22 rainy days, 110 hours of sunshine and an average temperature of 17° C. The month was thus cold and wet. The seed harvested in 1915 showed much less tendency to germinate than that of 1914.

The rapidity with which the germinating point is reached is not only subject to the influence of the temperature during the period of ripening but is also dependent upon the specific properties of the different varieties.

Tables I and II show, for certain varieties of wheat and barley, the percentages of grains ripe for germination. These percentages were determined at the same given moment – mid-September for wheat – early December for barley.

The time required for reaching the degree of ripeness requisite for germination is shorter in proportion as the seed is drier. It must be noted, however, that this point is not reached immediately after shrinking, which proves that the ripening process is not merely the mechanical result of loss of water but depends upon biochemical changes occurring within the grain.

How can the above facts be turned to the practical help of the farmer? At any rate we can see that varieties, the seeds of which are slow in reaching germination maturity (e. g. Sol), should be sown immediately after harvesting, otherwise they germinate too late and, with the advent of winter, the seedlings are weak, under-developed and more sensitive to the action of frosts and low temperatures.

In oats, the inner situated caryopsis (the smaller) matures earlier than the outer and, if the seed is not sorted with proper care, the seedlings develop very irregularly and the field looks very patchy.

In cold regions with an early winter it is consequently advisable to dispose of types of cereals which reach the degree of maturity necessary for germination as early as possible. The seedlings then appear in time

TABLE I. — *Percentage of grains ripe for germination in certain varieties of wheat at Svalöf, 1915.*

0-10 %	10-20 %	20-30 %	30-40 %	40-50 %	50-60 %
Thule Wilhelmina Fylgid Sammet	Extra-Squarehead II Pansar Pudel	Sol II 0904 Extra-Squarehead III Små	Thule Små + Sol 0921 Bore	Renodlad-Squarehead Grenadier III Sol II	Sol Små × Sol 0920

TABLE II. — *Percentage of grains ripe for germination in certain varieties of barley, at Svalöf, 1915.*

0-10 %	10-20 %	20-30 %	30-40 %	40-50 %	50-60 %	60-70 %	70-80 %
Strain 0246 Hviderup	Gull	Svanhals Strain 0178 Hviderup	Primus	ChevalierII	Prinzess Chevalier	—	Strain 0185 Hviderup

and at the commencement of the cold weather are already sufficiently developed and have acquired a considerable degree of resistance. On the other hand, the early maturing varieties are the ones most sensitive to rain and have a tendency to sprout in the ear or shock.

As a consequence of the above it is necessary in selection work to adhere to an average type, and this has been done at Svalöf. Sol wheat is too late. Sol II is much earlier, specially the 0904 strain. On the other hand, Pudel is somewhat too early and inclined to germinate in the ear; by crossing with Sammet a somewhat later type has been obtained: Thule.

Crossing Extra-Squarehead I with Grenadier has given Extra-Squarehead II, a good type with intermediate characters which correct the excessive earliness of Extra-Squarehead I.

221 - **Influence of Meteorological Factors on the Development and Yield of the Millets *Panicum miliaceum* and *Setaria italica*, in Russia.** — SIRIUSOV, M. G., in Труды по сельско хозяственной Метеорологии (*Work on Agricultural Meteorology*), No. XVI, pp. 118-131, 6 fig. Petrograd, 1916.

Owing to its marked resistance to drought, millet is particularly well adapted to farming conditions in South Russia, where its cultivation is being extended every year. It may, indeed, reach as far as the banks

of the Western Dvina but in proportion as it progresses towards north and west so its value and importance gradually diminish owing to the progressive diminution of the grain yield. The present paper gives the results of a series of researches made by the author with the object of studying the specific action of meteorological factors upon the development of millet at the Agricultural Experiment Station of Temir, district of Turgai. In addition to the variety commonly cultivated in this region various other botanical types with constant and well defined characters were examined. The cultivated types, as it happens, are composed of a mixture of forms with sometimes opposing characters, so much so that the action of a specific meteorological character upon the yield may remain completely hidden. Among the botanical varieties introduced in the course of the experiment are: *Panicum miliaceum nutans* var. *victoriae*, *Panicum miliaceum compactum* var. *dacicum* and "Sultan" millet, which is a kind of *Setaria italica*.

If an identical type of plant be sown at different periods, the different phases of development, occurring at different moments, will coincide with distinct meteorological values, and if any relationship exists between the yield and the course of meteorological phenomena, the grain yield in the various groups of plants should show considerable fluctuations.

In the present case, sowing was done at 4 different times: Ist group: April 23 – IInd group: May 3 – IIIrd group: May 13 – IVth group: May 24.

TABLE I. — *Summarises the yields per acre.*

Kinds	Seedling groups			
	I	II	III	IV
	lbs.	lbs.	lbs.	lbs.
Common	1 713	1 525	1 552	1 365
Panicum miliaceum nutans var. *victoriae* . .	3 211	2 208	1 606	1 499
Panicum miliaceum compactum var. *dacicum* .	2 211	1 713	1 606	2 045
"Sultan" millet	1 499	602	401	1 3/4

"Sultan" millet gave the most striking results; the delay in sowing involves progressive diminution in the yield, which drops from 1 499 to 602 and then to 401, while the plants of the IVth group hardly gave any ripe grain whatsoever. Similar results, though less distinct, are observed for *Panicum miliaceum nutans* and for *P. m. compactum* var. *acicum*, whilst for the commonly grown variety the fluctuations are feeble nd uncertain. This is due to the fact that this variety is composed of number of varied forms, reacting often in contradictory manner to a articular meteorological factor and so producing a kind of compensation.

In the comparative study of the physiological and meteorological data, the writer has considered the following phases of development: 1) first appearance of seedlings; 2) expanding of 3rd leaf; 3) expanding of 5th leaf; 4) stooling; 5) earing or emergence of inflorescence from sheath; 6) flowering; 7) milk ripeness; 8) complete maturity of grain. The appearance of the 3rd leaf coincides with the first growth outline and development of the lateral rootlets. If, at this moment, the meteorological factors are unfavourable, the rootlets develop very slowly, no roo hairs are formed and the plant is only fixed loosely in the soil so that at the smallest blow the plant bends and topples over. Table III gives data relating to temperature, mean readings and the total number of degrees distributed over 8 successive periods of development: 1) from sowing to the first appearance of the young plants; 2) from the appearance of the young plants to the development of the 3rd leaf; 3) from the development of the 3rd leaf to that of the 5th; 4) from the development of the 5th leaf to the stooling phase; 5) from stooling to emergence of inflorescence; 6) from emergence of inflorescence to flowering; 7) from flowering to milk-ripeness; 8) from milk-ripeness to complete maturity.

TABLE II. — *Data on temperature.*

Period of development	Group I			Group II			Group III			Group IV		
	Duration of period in days	Sum of temperatures	Mean temperature	Duration of period in days	Sum of temperatures	Mean temperature	Duration of period in days	Sum of temperatures	Mean temperature	Duration of period in days	Sum of temperatures	Mean temperature
1st	14	149°.2	10°.6	11	151°.4	13°.8	8	166°.8	20°.8	10	154°.2	15°.4
2nd	4	61°.6	15°.4	4	72°.8	18°.2	6	97°.3	16°.2	5	48°.5	10°.6
3rd	5	88°.0	17°.6	6	90°.1	15°.1	7	116°.2	16°.2	5	109°.5	21°.9
4th	6	84°.8	14°.1	2(3)	28°.3	14°.1	5	112°.0	22°.0	5	110°.1	22°.0
5th	26	439°.0	16°.9	25	469°.5	18°.7	19	386°.1	20°.3	22	479°.2	21°.8
6th	9	171°.3	19°.0	7	124°.0	17°.7	5	96°.3	19°.2	8	166°.2	20°.8
7th	14	322°.0	23°.0	15	350°.4	23°.0	18	427°.1	23°.7	18	441°.4	24°.5
8th	18	910°.3	22°.8	15	462°.8	24°.4	20	496°.1	24°.8	13	317°.4	24°.4
	96	1 722°.0	17°.9	89	1 779°.5	20°.0	88	1 898°.1	21°.5	86	1 850°.0	21°.5

The most important results may be summarised as follows:

1) Germination only takes place when the mean soil temperature (24 hours) at the spot where the grains are situated is not below 10-12° C. The higher the temperature the more rapid are germination and growth

In 1914, during the period between sowing and first appearance of the young plants, the temperature was an average one: 10° C for the Ist group, 16°.5 for the IInd, 20°.8 for the IIIrd. Corresponding to these data the length of the period diminished, from 14 days to only 8 days. In 1915, with groups sown at 7 different periods, still more striking results were obtained: the period required between sowing and appearance of the seedlings being rapidly shortened This is due to the course of the spring season with accompanying rise of temperature; the periods are: 20 - 18 - 13 - 6 - 5 - 4 - 3 days.

2) Thermal conditions have a clear influence on the flowering phase, which is more rapid the greater the daily rise and fall of temperature. During the 14th and 15th July 1914, hourly determinations were made of temperature, the thermometers being held at a height of 71cms. above the ground, i. e. at the level of the inflorescence. From 5° C at 4 a. m. the temperature rose to 30°.3 C at 2 p. m; at 11 a. m., at a temperature of 30° C, notwithstanding the night had been very cold. 135 to 140 flowers opened simultaneously.

3) The rainfall values are spread over various periods of development. In this case, 6 periods only are distinguished, instead of 8; they are: 1) sowing; 2) appearance of young plants; 3) development of the 3rd leaf - stooling; 4) stooling – earing; 5) earing – flowering; 6) flowering – complete maturity.

TABLE III. — *Data on Rainfall.*

Periods of development	Seeding groups I	II	III	IV
1st	11. 2 mm	3. 7 mm	2. 1 mm	46. 3 mm
2nd	—	2. 1	23. 2	17. 1
3rd	4. 1	27. 1	17. 1	2. 1
4th	61. 6	35. 8	10. 6	10. 6
5th	10. 6	10. 6	—	—
6th	2. 4	2 6	5. 8	9. 5

The critical period for millet with respect to rainfall coincides with the stooling phase, although it is not yet exactly known whether the notable need of water by the plant at this moment is to be correlated with the actual stooling process or with the development of the lateral rootlets.

4) In the atmospheric layer where the millet develops its epigeal portions (stem and flowers), the plant itself takes special precautions thanks to which the meteorological factors are modified and fixed as the result of quite special combinations and relationships. It creates a kind of

micro-climate. This results from hourly observations on the temperature and humidity of the atmosphere by means of instruments situated amongst the crop. Minima thermometers were employed, one placed at the surface of the soil and the others at 18 — 36 — 53 — 71 cm above, and also a hygroscope placed at 35 cm. above soil level.

222 - **Water Penetration in the "Gumbo" Soils of the Bellefourche Reclamation Project, South Dakota, United-States.** — MATHEWS, O. R. in *U. S. Department of Agriculture, Bulletin*, No. 447, 12 pp. 4 fig. Washington, D. C., November 2, 1916.

The readiness with which water penetrates into any soil determines to a great extent the amount that will be available to crops. An accurate knowledge of water movement within a soil often furnishes an indication of the farm practices that will be most successful. Thus, under irrigation the rapidity of water percolation may determine in what way and at what time water may be most effectively applied. On dry land a knowledge of moisture movement often shows what results may be expected from different cultural methods calculated to increase the quantity of water entering the soil.

The gumbo soil of the Belle Fourche (S. Dak.) Reclamation Project offers problems in water penetration materially different from those in soils of other types. These differences are due largely to its peculiar physical characteristics.

This bulletin presents the results of certain studies of the penetration of water into the gumbo soils of the Belle Fourche project.

Water movement in the gumbo soils of the Belle Fourche Reclamation Project may be summed up as follows:

On a dry soil, penetration takes places rapidly to a depth of about 2 feet because of the cracked condition of the soil near the surface. After the layer of easily penetrated soil becomes wet, it becomes so swollen and compact that it is nearly impervious, and further water movement is very slow.

The fact that moisture can move only very slowly in the wet surface soil would make it necessary to run water over the soil for a very long time in order that any considerable portion might be absorbed. This is not practicable, for the experiment with a dry subsoil showed that water from the surface penetrated almost as deep in a few minutes as it did in 10 days, so that the increase in the amount of moisture absorbed where the water stands for any considerable length of time over that taken in when the soil is simply covered would be so small as to be negligible. After a field has once been covered with water little benefit can result from allowing the water to stand on or flow over the soil.

It is interesting to note the radical difference in water absorption between this soil and the sandy loam soil at Scottsbluff. The maximum rate of absorption is obtained on the wet soil at Scottsbluff and on the dry

soil on the Belle Fourche project. These diametric differences apparently are due to the physical differences between the two soils and show clearly that a satisfactory practice on one type of soil may not be equally successful under other soil conditions.

The results of these experiments and observations can easily be applied in field practice, and recommendations for methods and practices may be based upon them.

The following points relative to the application of water by irrigation to these gumbo soils are clearly shown:

1) Water should be applied only when the surface is dry.

2) The quantity of water absorbed will depend upon the dryness and the cracked condition of the surface soil.

3) After a field has once been covered with water, little further absorption takes place, and no benefit can result from having water stand on or flow over soil which was previously dry and cracked.

The following points brought out in this bulletin apply to the cultural practices for these gumbo soils either under irrigation or dry land conditions:

1) No particular method of cultivation will be superior to others in influencing the quantity of water absorbed, since this depends upon the degree to which the surface soil is dry and cracked. The soil after harvest is usually so dry that atmospheric falls are absorbed, regardless of the cultural treatment.

2) Since the dry soil is naturally broken up to depths as great as would be reached by either deep plowing or subsoiling, these operations can be of no great benefit in water absorption.

3) Some method, such as dynamiting, by which the soil below the cracked area could be broken up, might result in a temporary increase in the depth to which water could easily penetrate. The natural swelling of the soil, however, would cause it to become compact again every time it was wet. This would make it necessary for the operation to be repeated each year. The expense such a method would entail would be so great that, from a practical point of view, it would not be possible to consider it seriously.

223 **Draining and Cultivation of the Poitevin Marsh, France.** WELSH JULES, in *Annales de Géographie*, Year XXV, No. 137, pp. 325-346, 3 fig. Paris, 1916.

The writer, professor of geology at the University of Poitiers, gives an account of the features of the Poitevin Marsh, a plain 185,250 acres in extent and of low altitude, situated in the Deux-Sèvres, la Vendée and the Charente-Inférieure, along the littoral. It is an old gulf which has been filled up since Tertiary times by Quaternary and Recent marine and river alluvia. The marine alluvia predominate, forming the "*bri*"

of the peasants. It is a marly Scrobicularia (1) clay of modern formation To the north-west, the Marsh is bounded by dunes, also of quite recent formation. It is a formation analagous to those of the other coastal marshes (Aunis and Saintonge, Marais de Dol in France; *polders* in Belgium and Holland; Thames marshes and Fens in England, etc.).

The dunes, posterior to the " bri ", protect the Marsh from the sea; they have often been strengthened by dykes. In certain parts they are covered by pine forests; in others nothing but Marram grass (*Ammophila arenaria*) is grown. Certain portions have long been in demand for market gardens: the fields are " buried ", that is to say a portion of the sand is removed in order to get nearer to the moist layer, the higher borders acting as a protection against the sea winds.

The inner portion of the Marsh is next examined by the writer, where the thickness of the " bri " is very variable, in some spots reaching as much as 28 metres. The surface, in the hollows, has been covered with modern alluvia formed of a clayey-sandy silt, often containing vegetable remains. The soil so formed is a blackish grey vegetable earth, spongy and finely divided, in great demand for certain crops, especially beans.

In order to exploit the Marsh, both the fresh water and the sea have had to be contended with. Dykes extending further and further westward have been built as a protection against the sea: 1 kilometre has been gained in the course of a century. The Isle of la Dive, near Cape Aiguillon, which in 1755 did not yet form a part of the coast, is now in the middle of the Marsh. Draining has had to be carried out as a protection against the fresh water: the " bri " being impermeable, the level of the small watercourses tends to rise after rain and to submerge the country. These small watercourses have had to be dyked and closed by sluices in order to prevent the tide from driving back the fresh water.

In order to carry out the work of draining, a portion of marsh was chosen untraversed by streams and with a natural tendency towards drying. This was then surrounded with a dyke or " bot " and within the area so enclosed ditches were dug in order to carry off the enclosed water.

The slope on the external face of the " bot " is steeper than that on the inner face. On the inner side it is accompanied by a ditch known as a " contrebot ", on the outer by another called " achenal ". The portion contained within the " bot " is the drained or dried Marsh; that

(1) The writer proposes the adoption of this term (used in England since 1868 for similar deposits) in order to denote the formation or deposits of marine muds which have filled the inlets of the French littoral since the end of the quaternary period. *Scrobicularia plana* (*piperata*) is an edible bivalve mollusc, known as " lavagnon " or " lavignon " by the fishermen.

(*Ed.*)

without is the " wild " or wet Marsh, which serves as an overflow bed for the rivers in times of flood. The writer gives a very complete historical review of the progress of draining since the Gallo-Roman period.

The whole of the artificial channels for carrying off the water are practically without " drop ", if not carefully looked after they would rapidly become choked. Necessity has bred a spirit of cooperation among the peasants of the " Plaine " who are also proprietors of the Marsh. A whole system of associations, syndicates etc. has been gradually created since the middle ages for the protection of wet and drained marshes, the upkeep of the ditches and the removal of weeds in dry years. The State bears a portion of the cost of this important work.

Thanks to the above transformation, malarial fever has disappeared and the whole of the Marsh is under cultivation. The dried marshes possess no trees and practically no houses (1). Cereals are the chief crops: wheat, oats and legumes: garden and field-beans. Fertiliser is supplied by the cleanings from the ditches. A certain portion is left as natural pasture and serves to rear horses and horned cattle. The level of the wet marshes is generally lower than that of the dry. For a long time the former were abandoned to aquatic plants; the inhabitants living in huts built of reeds and clay. All this was transformed during the course of the 19th century when dykes were made separated, from which the earth necessary for their construction was taken. Upon the embankments (" terrées ") and mounds (" mottes ") so formed trees were planted: willow, ash, osier, poplar. In the drier portions are cultivated flax and hemp, beans, beets; the area of pasture has increased considerably since 1866-1890, owing to the development of cooperative butter factories. Certain wet marshes which in 1840 were only worth £ 4. 16s. 3d. per acre now fetch ten and even twenty times that amount. Market gardens (*terre chambaud*) have been formed everywhere. At the present day the area of wet marsh is 61 750 acres and of drained marsh 98 800 acres. The value of the latter exceeds 120 million francs, the former having an equal or even greater value.

In conclusion, the writer gives an account of the intensive use of the water courses as a means of transport. The paper contains references to a very large number of works dealing with the Poitevin Marsh.

224. - **Irrigation Work in Chili.** OPAZO, ROBERTO G., in *El Agricultor*, pp. 272-274, 5 fig. Santiago de Chile, November, 1916.

The land actually under cultivation in Central Chili covers 15 045 871 hectares (2), of which 1 067 003 are irrigated, and 1 000 000 capable of

(1) Wood is so rare in the western portion of the Marsh that animal dung is preserved for drying in the spring and burning as a kind of peat.

(2) 1 hectare = 2.4711 acres. (*Ed.*)

irrigation. The forests from Malleco to the South are not included in the area under cultivation. Irrigation is of great importance to Chili where the rainfall is practically entirely restricted to the winter season and the summers are very long and hot. Irrigation work was begun more than a century ago with the construction of the Maipo canal, following which many other small irrigation works were carried out by private persons. Lately, law No. 2953 has ordered the construction of 4 large irrigation canals. Among these latter, the Manco canal, in the province of Valparaiso, is already well on the way to completion, the surveys of the Maule and Laja canals are finished and those of the Melado canal in the province of Linares are well forward. These 4 canals will irrigate an area of 120 000 hectares. Further, several projects for dams are under consideration. Among these is one on La Laguna, a tributary of the Elqui or Coquimbo, which will permit of the impounding of 40 000 000 cubic metres of water and of the irrigation of the Elqui valley, more than 20 000 hectares. In the province of Santiago, the Yeso dam will be able to hold up more than 200 million cubic metres of water to organise the district served by the Maisso and to ensure a supply of water to a canal which will irrigate the Department of Melpilla. The survey of the irrigation works for the Polpaico valley, a little to the north of Santiago, is already very well forward, thanks to the possibility of using the waters of the Aconcagua. Finally, there is the project for regularising the Teno, which irrigates the province of Curico, and that for the Mondaca, a tributary of the Lontué which will allow of the irrigated area in the province of Talca being greatly extended. The plans relating to this last project are executed by the " Inspección general de riegos ".

225. — **Researches on the Method used for Determining the Water-content and the Dry Matter in Vegetable Products** (1) LEBEDIANZEV A. N. and ZALYGUINE G. I. (*Chemical Laboratory* of the Schatilovskaia Agricultural Station, Russia) in Журналъ Опытной Агрономіи имени П. С. Коссовича (*Review of Experimental Agriculture dedicated to the memory of* P. S. KOSSOVITCH), Vol. XVII, Part 3, pp. 181-130. Petrograd, 1916.

The results of analyses of vegetable products are often related to the dry matter, considered as such when at " constant weight ". In this connection the writers had much difficulty during their work in 1915: they could not obtain a " constant weight " by drying vegetable matter; losses continued to take place for an indefinite period, resulting that no data could be obtained to show that the water was completely eliminated. This fact induced the writers to study the value of the ordinary method used to determine the content of water and dry matter, which consisted in

(1) See also *B.*, January, 1917, No. 19.

drying the vegetable matter at a high temperature (100-105° C or 105-110° C) in an ordinary steam-oven, till of " constant weight ".

The work was divided into three parts as follows:

Part I: The writers attempted to define with the utmost precision the fundamental fact of the continued loss of weight of the substance at 100° C in air. At the same time they determined the products eliminated to find out the proportion of water.

Part II: They studied the changes during decomposition of vegetable matter when the temperature and pressure are changed and the air is replaced by carbon dioxide.

In the first and second parts they studied one plant only, viz. young wheat, being unstable and thus being specially suitable for these researches.

Part III: The writers also studied other plants so as to permit of generalising their conclusions.

In the first part, the substance to be dried was placed in a glass U tube with a ground stopper, and which was placed in a glycerine bath warmed to a given temperature. A current of warm air, with its water and CO_2 removed by passing through calcium chloride, concentrated sulphuric acid and caustic soda, was passed through the U tube; after passing through this the air went through 3 U tubes full of calcium chloride, then through an apparatus containing caustic soda in solution and in small pieces.

RESULTS OF THE RESEARCHES. — During drying of the young wheat plants it was noticed that from the beginning, besides the water, carbon dioxide was given off as well as some organic compounds that might alter the results of both acids as well as normal alkalis. In addition there was reason for thinking that part of the decomposition products might be retained by the calcuim chloride, the latter absorbing them more rapidly than water. In every case the loss of weight of the dried substance is smaller than the increase in weight of the absorption apparatus, which makes it seem likely that oxidisation and hydration play a part in the decomposition.

These observations agree with these of BERTHELOT on the elimination of carbon dioxide from vegetable matter.

The decomposition of the vegetable matter of the young wheat plants during drying at 100° C increases greatly; the losses of weight of the substance and the increase in weight of the absorption apparatus were recorded for 66 hours. This prolonged decomposition does not agree with BERTHELOT'S results, but it is conformed by those of other authors.

The following changes: lowering the drying temperature to 80 and 60° C – decreased pressure – replacing the oxygen by a stream of CO_2 – varying the time the gas passes through the drying substance – have no definite influence on the rate of decomposition; in every case the loss in weight of the drying substance continued uninterruptedly for a long time.

The amount of loss depends chiefly on the drying temperature and relatively little on the quickness of elimination of water vapour. The diminution of pressure and the absence of oxygen had no apparent effect. The importance of the temperature is so great that each given temperature corresponds to a given amount of loss, which cannot be obtained from a lower temperature no matter how long the time.

At the normal temperature in a dessicator containing sulphuric acid and phosphorus anhydride, the vegetable matter continued to lose weight during 4 to 7 months, then a state of equilibrium was set up which may not be the end of the decomposition.

These phenomena of indefinitely prolonged decomposition during drying are not only seen in young wheat, but also in young winter rye and oats, and the winters have also found them in adult plants: winter rye – oats – flax – potato tubers – mangold roots – clover – lucerne – vetch. The young shoots are the most liable to this de composition, especially those of winter wheat: in 33 hours of drying, after eliminating the water, they lost about 1.6 % of their weight, whilst adult plants did not lose more than 0.6 %. Amongst the latter the least resistant are beets, clover and lucerne, as shown in the following table, where the losses of weight for the first 9 hours of drying have been taken as 100, so as to correlate the loss of weight in various successive periods of time.

Losses in weight during drying for various adult plants, correlated whith the losses for the first 9 hours taken as 100.

Hours of drying	Rye	Oats	Flax	Potato tubers	Beets (roots)	Clover	Lucerne	Vetch
0–9	100	100	100	100	100	100	100	100
9–27	2.45	2.24	+ 0.62*	1.64	10.14	3.26	3.40	1.60
27–42	2.32	2.77	3.72	1.98	6.97	3.67	3.32	2.95
9–42	4.77	4.01	3.10	3.62	17.11	6.93	6.78	4.5

* The sign + shows an increase in weight.

CONCLUSIONS. — The determination of the water in vegetable matter has a double aim: 1) to find the amount of water itself; 2) to obtain figures relating to the dry matter content, by eliminating the water as not being connected with the fundamental properties of vegetable matter.

The results of these researches have shown that the present method for finding the water content does not fulfill these two aims. In fact, the actual water content is not known, as the elimination during drying is not pure water, but is a mixture of water and decomposition products of the

vegetable matter, and the residue after drying is not the pure dry matter but is more or less oxidised and hydrated. Again these methods are too inaccurate to give comparable results: for the idea of "constant weight," under its apparent accuracy, prevents the exact comparison of a number of analyses from different sources, because the various manipulators prolong the period of drying more or less according to their personal views.

To eliminate these inconveniences, the winters propose to all analysts of vegetable matter: 1) to consider the usual method for determining the water content as *conventional* and to abandon completely the ideas of "constant weight" and "hygroscopic water"; 2) to decide the type of water oven to be used, as well as other details of the determination.

226 - **The Chemical Composition of the Mulberry Leaf.** — See No. 267 of this *Bulletin*.

227 - **On the Resistance of Plants to Withering.** — CAVARA, F. and PARISI, R. in *Bollettino dell'Orto Botanico de la R. Università di Napoli*, Vol. V, pp. 261-273. Naples, 1916.

The results of a series of experiments made by the 2 writers in the Botanic Garden of the University of Naples, in order to study the resistance of plants to withering, as well as its relationship to the nature and structure of the soil (period 1915-1916).

PLANTS EXAMINED: Mustard (*Sinapis alba*); Bean (*Vicia Faba*); Chick pea (*Cicer arietinum*); Cotton (*Gossypium herbaceum*); Wheat (*Triticum vulgare*); Castor oil plant (*Ricinus communis*); Maize (*Zea Mays*); American Sorrel (*Rumex vesicarius*); Tripolitan Barley (*Hordeum vulgare*); Sea Daffodil (*Pancratium maritimum*).

The experiments were started in the summer of 1915. Cylindrical glass jars holding about 49 cub. ins. were used, being filled with various soils, previously dried, and chosen according to practical criteria: soils were chosen either of workable nature, or of notorious sterility, such as the sands and red earths of Tripoli.

To each jar 25 cc. of water were given to each 6 cub. in of earth. Five days after sowing or planting and as soon germination had commenced, each jar was weighed. The weighing was repeated every 5 or 6 days until evident signs of withering were observable, when the plant was removed. Then the dry weight and the water content of the soil were determined. According to the writers, it is not accurate to define the remaining moisture alone as the *withering coefficient*, without taking into account the number of days of growth of the plant up to withering. On the contrary, the figures for the growth in length and the dry weight of the plants have less importance for a short experiment and in a limited amount of earth. The most important experimental results are summed up as follows:

DURATION OF GROWTH UP TO WITHERING. — The length of the resistance varies with the soils and is related to the poverty or richness in organic matter that modifies the water capacity of the soils, and with the water content of the atmosphere.

It is usually shorter in sandy soils such as the red soils of Tripoli, sea or river sands, pozzolona. There is an average of 20 days during the summer-autumn period of 1915 for the laboratory experiments, while there is an average of 28.5 days for silicious soils containing more or less humus, such as the soil of the Naples Botanic Garden and two soils from Pomigliano d'Arco.

THE HUMIDITY REMAINING IN THE SOIL. — The humidity remaining in the soil shows important variations, either as to the soil structure, or relatively to the hygroscopic state of the air; while it increases with the increase of soil humus, it decreases when the moisture content of the air increases. The averages are: for sandy soils, 2.518 grms % (1915) and 3.040 grms % (1916) and for humous soils, respectively 6.891 grms and 6.935 grms %.

THE LENGTH REACHED BY THE PLANTS. — There are only slight differences in the average lengths in relation to the various types of soil. In fact, for the laboratory tests in 1915, an average was reached of 15.08 cm. for sandy and 15.82 for humous soils. In the 1916 tests, the average was 25.75 cm. for sands and 23.13 cm. for the humous soils.

DRY WEIGHT OF THE PLANTS. — Results obtained by weighing show higher and higher averages for plants grown in sandy soils, as against those from humous soils. This may perhaps be attributed to a larger development of mechanical tissues in the plants from sandy soil, and parenchymatous tissues etc. from those of humous soils.

SPECIFIC BEHAVIOUR OF THE PLANTS. — The resistance of plants to withering may be deduced from the time elapsing between germination and withering, as well as from the way the water given was used, indicated by the water remaining in the soil after the withering of the plant. But, by following these criteria, one is led to accept the idea of a specific behaviour, which becomes more evident on taking averages for each plant both of the duration in days and the water content remaining.

TABLE I. — *Average duration.*

1915 Tests		1916 Tests		Glass-house tests (1915 cult.	
Mustard	24 days	Bean	28.5 days.	Wheat	60.5 days
Bean	19.5 »	Chick Pea	30 »	Barley	67.5 »
Cotton	21 »	Maize	24 »	American Sorrel	84.5 »
Wheat	28 »	Castor oil plant	35 »	Sea Daffodil	100 »
Chick Pea	27.5 »				
Maize	38.5 »				
Castor oil plant	35 »				

From the figures in Table I, it is seen that in the various experiments, there is a notable difference of duration between a minimum of 19.5 days (Bean, 1915) and a maximum of 100 days (Sea Daffodil 1915-1916, in glass-house).

TABLE II. — *Average remaining humidity.*

1915 Tests		1916 Tests		Glass-house tests (1915-1916)	
Mustard . . .	3.516 grm %	Bean	3.830 grm %	Wheat . . .	2.950 grm %
Bean	5.000 »	Chick Pea . .	8.655 »	Barley. . . .	2.830 »
Cotton . . .	5.574 »	Maize	11.405 »	American Sorrel	2.645 »
Wheat. . . .	4.925 »	Castor oil plant	4.965 »	Sea Daffodil .	0.663 »
Chick Pea . .	4.035 »				
Maize	7.570 »				
Castor oil plant	5.545 »				

The figures of Table II show a very different specific behaviour for the different plants, for they may vary from a minimum of 0.663 grm % (Sea Daffodil) to a maximum of 11.405 grm % (Maize, 1916). Thus one gets specific values that are notably different both as regards the duration of the plants and the utilisation of the water.

228 - **The Function of Anabiosis in the Hibernation of Winter Grain Crops.** — SABACHNIKOV, V. in Журналъ Опытной Агрономіи имени П. С. Коссовича (*Review of Experimental Agronomy dedicated to the memory of* P. S. KOSSOVITCH), Vol. XVII, No. 4, pp. 334-335. Petrograd, 1916.

The writer summarises the observations and theories of A. STEBOUT on the question of the hibernation of winter sowings.

According to STEBOUT the degree of the winter check depends largely upon the variety. Observations at the Saratov Agronomical Station have shown that during the winter 1914-1915, plants with an erect system of stooling succumbed whilst those with a spreading system withstood the cold well and gave a crop.

The samples from the collection of winter wheats harvested in 1914 at the Saratov Station behaved differently during the autumn of the same year; notwithstanding the favourable conditions of temperature and moisture the plants resulting from these seed samples suspended growth in length and seemed to concentrate their activity on preparing for hibernation. On the other hand, several other types from this collection continued to grow, possibly with less energy as the temperature gradually fell, but in any case without definitely reaching the growth suspension

stage; apparently these types were not preparing for hibernation but had merely suspended their *ordinary* physiological processes on account of lowering of temperature.

In order to explain this difference, the writer considers that the suspension of autumnal development of winter wheats may be the result either of a simple reaction against lowering of temperature, or else from the passing of the plants to the *anabiotic* state, analogous to the anabiosis of animal organisms (1).

---

(1) In a paper entitled « Anabiosis and its importance in agriculture » Сельское Хозяйство Лѣсоводство *Agriculture and Sylviculture*, Vol. CCXL, Year LXXII, pp. 345-354. Petrograd, November 1912, P. BAKHMETIEV describes the method he employed in order to induce, under the action of low temperatures, the anabiotic state in an animal, i. e. the state in which the animal no longer gives any evidence of life.

A given animal *B* is placed in an air bath (fig. 1) surrounded by a mixture of pounded ice and salt; the water resulting from the melting of the ice is eliminated by the siphon *C*; the temperature within the recipient is lowered to — 22° C. The temperature of the animal is measured with the aid of an electric thermometer composed of two fine metallic threads *a* and *b* (one of iron, the other of nickel), soldered together at one extremity which is then inserted in the back of the animal *B*, if an insect, or in the anus if it is a mouse, for instance. The free ends of both threads are then connected to a sensitive mirror galvanometer.

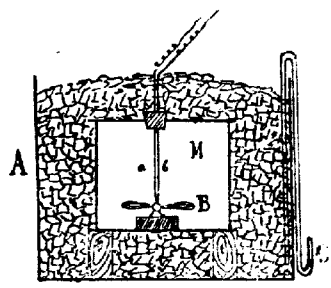


Fig. 1. — BAKHMETIEV'S apparatus for experiments on animal anabiosis (B = body of an insect).

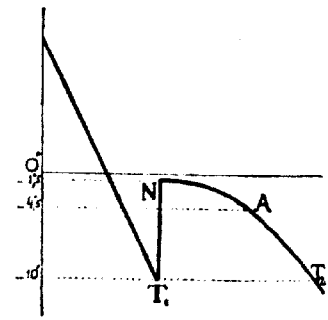


Fig. 2. — Temperature curve of an animal under experiment (AT_1 = anabiotic state).

Shortly after the animal has been placed in the cold air bath, readings of its temperature must be made at intervals of one minute: at first the temperature falls in regular fashion but no sooner has it reached the point T_1 (which, for insects, is in the neighbourhood of — 10° C) than it makes a sudden jump to *N*, about — 1°,5 C. For a few minutes the thermometer remains stationary at this point, after which it begins to fall

It is thus legitimate to suppose that the various types of cereals are capable of differing with regard to the anabiotic state: thus, those cereals which are incapable of assuming this state must often fall easy victims to the cold.

Such types are probably most frequently encountered among the oats, barleys and winter wheats distributed over the southern part of Russia; these are, at bottom, "spring" cereals but require to be sown early as they need low temperatures if their later development is to be stimulated in normal fashion.

On the other hand, the varieties which are capable of assuming the anabiotic state may support even very severe winters, and the more thorough the anabiosis the easier they will do so.

---

slowly (fig. 2). When the temperature reaches — 4°.5 C. the writer has shown that all the liquids contained within the animal body solidify. »

This marks the beginning of what the writer calls the *anabiotic* state, where circulation, respiration and nutrition completely cease. If, subsequently, the temperature falls as low as the point T_2 (usually — 10° C) the animal will perish.

The limits of the anabiotic state thus being the point A (— 4°.5) and the point T_2 (about — 10°), in order to revive the animal it must be withdrawn from the first air bath when its body temperature falls between these limits, e. g. at - 7° and placed in another air bath the temperature of which is more or less constant between the limits — 5° and — 9°. The animal may be kept for any period without dying. If it is removed and kept at room temperature it will revive.

To sum up, P. BAKHMETIEV defines the anabiotic state as the state of interruption of the vital functions prior to the resumption of the same.

In Dr. HEINRICH SCHMIDT'S *Worterbuch der Biologie* (Leipzig, 1912) on page 15, under the heading ANABIOSIS one reads: « Many invertebrates (or their germs) possess the faculty of passing through periods of extreme drought or excessive cold in a state of apparent death, and of subsequently resuming life when the environmental conditions are more favourable.

This reawakening to life is termed *Anabiotis* and animals possessing this faculty are said to be *anabiotic*.

In the NOUVEAU LAROUSSE ILLUSTRÉ, ANABIOSIS is defined as follows: « (from the Greek ἀναβίωσις = resurrection); return to life, after an interruption of the vital functions presenting more or less the character of death. *Anabiosis* is very common in the plant kingdom. See REVIVISCENCE (synonym).

Under this heading one also sees: « Dessicated organisms no longer show any of the characters proper to living beings: their state is intermediate between life and death; it is the *latent death* of CLAUDE BERNARD, the *apparent death* of the Germans, the *amibiosis* of PREYER. It must be interpreted as a protective acquisition of organisms exposed to alternative conditions of drought and humidity ».

In FUNK'S STANDARD DICTIONARY OF ENGLISH LANGUAGE (London and New York, 1911) ANABIOSIS is defined thus: « (from the greek ἀναβιῶ = to resuscitate); a coming to life again, resurrection » — ANABIOTIC: medical term; restoring animation, acting as a stimulant.

Numerous observations justify the supposition that for these types the critical period is not winter but spring, that is to say, the season in which they lose their faculty of anabiotic defence as a result of the awakening of their vital functions.

229 - **Effect of Sodium Salts in Water Cultures on the Absorption of Plant Food by Wheat Seedlings** - BREAZEALE, J. F., in *Journal of Agricultural Research*, Vol. VII, No. 9, pp. 407-416. Washington, D. C. November 27, 1916.

These experiments were undertaken to determine the extent to which the presence of the various sodium salts commonly found in alkali soils affects the absorption of plant-food elements by wheat seedlings.

Sodium salts used: chloride, sulphate and carbonate in concentrations ranging from 50 to 1000 parts per million in solution by weight.

Standard nutrient solution of 200 p. p. m. of NO_3 as sodium nitrate 200 p. p. m. of K_2O as potassium chloride and 130 p. p. m. of P_2O_5 as sodium phosphate together with calcium carbonate in excess.

Variety studied. « Minnesota Bluestem » C. I. 169. *Triticum vulgare.*

The percentage of nitrogen absorbed does not appear to be measurably modified by the presence of any of the sodium salts investigated in concentrations up to 1000 p. p. m. Sodium chloride in these concentrations does not affects the absorption of phosphoric acid to any noticeable extent, but slightly depresses the percentage of potash absorbed, as is shown by Table I.

TABLE I. — *Effect of sodium chloride and sodium sulphate on the absorption of nutrients by wheat seedlings.*

	Sodium chloride				Sodium sulphate			
Culture No.	Sodium chloride added to nutrient solution	Elements absorbed from solution (in % of dry weight of plants)			Sodium sulphate added to nutrient solution	Elements absorbed from solution (in % of dry weight of plants)		
	P. p. m.	N.	K_2O	P_2O_5	P. p. m.	N.	K_2O	P_2O_5
1. . .	0	3.1	6.3	1.7	0	2.8	6.0	2.0
2. . .	50	3.3	5.5	1.7	50	2.1	5.7	2.1
3 . .	100	3.6	5.7	1.9	100	1.8	5.6	1.9
4. .	200	3.5	5.9	1.8	200	2.3	6.4	1.9
5. . .	300	3.6	5.5	1.9	300	2.4	5.8	1.8
6. . .	400	3.0	4.5	1.5	400	2.2	5.7	1.6
7 . .	500	3.5	6.6	2.1	500	2.5	5.1	1.7
8. . .	1000	3.0	5.5	1.7	1000	2.2	4.0	1.4

Sodium sulphate distinctly depresses the absorption of potash and of phosphoric acid, sodium carbonate causes a more marked depression in the absorption of both potash and phosphoric acid, as in seen from Table II.

TABLE II. — *Effect of sodium carbonate on the absorption of nutrients by wheat seedlings.*

Culture No.	Sodium carbonate added to nutrient solution P. p. m.	Elements absorbed solution (in % of dry weight of plants)		
		N.	K_2O	P_2O_5
1.	0	1.4	5.6	1.9
2.	50	1.6	5.6	1.7
3.	100	2.2	5.5	1.7
4.	200	2.3	5.9	1.6
5.	300	1.9	5.2	1.4
6.	400	3.0	4.2	0.8
7.	500	1.3	2.5	0.7
8.	1000	1.4	1.0	0.4

The depressing effect of sodium carbonate is shown in concentrations as low as 100 p. p. m. The presence of even minute amounts of sodium carbonate in the soil may have a marked deleterious effect upon the metabolism of small-grain crops, especially during germination, since at that time the seedlings require to absorb a large quantity of potash.

230 - **The Assimilation of Nutrients by the Rice Plant: Studies made in India.** — GATINDRA NATH SEN in *Agricultural Research Institute, Pusa, Bulletin* No. 65. pp. 1-13. Calcutta 1916.

The result of experiments in the assimilation of nutrients by the roots, culms, leaves and seeds of the rice plant. The samples were taken at different stages: — I. very young seedlings — II. seedlings ready for transplanting — III. adult plants in pre-flowering stage — IV. plants beginning to flower — V. grain in milk stage — VI. plants ready for harvest — VII. plants in dead ripe stage.

Nitrogen. — During the very young seedling stage, the roots contain 2 per cent of nitrogen which falls during the 2nd stage to 1 per cent, during the 3rd stage to 0.74 per cent, and during the 4th stage when the grain is scarcely formed to 0.52 per cent, at which figure it remains practically constant until the plant is quite ripe.

In the above-ground parts of the plant, as in the roots, the nitrogen percentage diminishes as the plant advances in age. It decreases from 3.48 per cent in the very young seedling, to 0.80 per cent at the time of harvest. The fall is especially rapid between the 1st and 2nd stages, during which interval the nitrogen content decreases from 3.48 per cent to 1.34 per cent. During the 2nd and 3rd stages, the leaves are much richer in nitrogen than the stems (2.11 — 0.77 and 1.44 — 0.79 per cent respectively). As the ears form, both the leaves and the stems lose their nitrogen. The nitrogen accumulates most in the grain (1.6 per cent), while all the other parts of the plant contain practically the same amount (0.5 per cent).

Phosphoric acid. — In the roots, the percentages of phosphoric acid fall as the plant advances in age: from 0.37 per cent in very young seedlings to 0.15 per cent in ripe plants. In the above-ground parts, on the other hand, the phosphoric acid content decreases from 0.40 per cent in the young seedling to 0.22 per cent in the plant just before flowering, but rises again when the grains fill up (in the early stages of the ripening of the grain it reaches 0.38 per cent) to fall again to 0.26 per cent at the time of harvest. Till about the time that the flowers appear, the roots and the above-ground parts are about equally rich in phosphoric acid. With the emergence of the panicle, the phosphoric acid accumulates more in the above-ground parts than in the roots.

As the ears mature, there is an accumulation of phosphoric acid in the grain, while the other parts of the plant become poorer, all ultimately containing about the same percentage: 0.15.

Potash. — The percentages of potash in the roots are the same in the first and second stages (1.85 — 1.91 per cent). Afterwards, they decrease progressively, falling to 0.66 at the time of harvest.

The percentage of potash in the leaves and stems, on the other hand, reaches its maximum in the third stage, before the adult plant has yet flowered (3.13 per cent).

Assuming the average yield of dry grain to be about 900 lb. per acre, it is seen that, neglecting the amounts absorbed by the stubble and the roots, such a crop removes from the soil 29.33 lb. nitrogen, 9.64 lb. phosphoric acid and 49.69 lb. potash. These figures give an idea of the amount of manure required by rice.

Since practically all the nitrogen, phosphoric acid and potash are absorbed by the plant in the early stages of its growth, it is essential that manure should be applied in good time. Later on, during the stages following transplanting, manures might be of indirect advantage, but after the formation of the ears, the amounts of plant food material taken up would be negligible, as the absorption processes then are superseded by assimilation and the translocation of the materials absorbed which continue to accumulate in the grain.

231 - **Studies on Oat Breeding in Maine, United States. Selection within Pure Lines.** - SURFACE, M., FRANK, and PEARL, RAYMOND, in *Maine Agricultural Experiment Station, Bulletin* 235, pp. 1-40, Orono, Maine 1915.

Previous to 1910, it was almost universally assumed that small fluctuating variations were, to some extent at least, inherited. It was further believed that such variations were cumulative in effect, and that substantial progress in breeding in a desired direction could be made by selecting in successive generations, those individuals showing the given character in the most pronounced fashion.

But DE VRIES' mutation theory and the study of MENDEL'S law have shown that variations caused by external conditions are not transmitted in any degree from one generation to another, and that individual characters, both in animals and plants, are inherited as units. The germ plasm is no longer regarded as a plastic substance that can be moulded by the environment, or by selection, but rather as a mosaic made up of a vast number of definite, stable units. As small fluctuating variations due to changes in environment in no way influence these independent units, they cannot be inherited.

In 1903, as a result of many experiments, JOHANNSEN announced that in self-fertilised plants there was no effect of selection within a " pure line ". He defined a " pure line " as the offspring of a single, self-fertilised, homozygotic individual

The article analysed gives the results of 3 successive years of selection within pure lines of oats: 20 pure lines representing 13 varieties were used and over 12 500 plants.

The characters studied were weight of grain - weight of plant and of straw — height of plant — number of culms, and the correlation between the number of culms and their length and grain yield.

Grain Yield. — In the case of each line, the selection was carried out in 2 opposite directions: from each generation were selected the most productive individuals (the positive, or + deviations) and the least productive individuals (negative, or — deviations) for the purpose of calculating the plus, or minus, deviations in the successive generations. Finally, in each of the two groups, the rows of plus deviations and those of minus deviations were estimated. Table I summarises the results produced in 3 succeeding generations by selecting individuals having a larger, and those having a smaller, yield than the average plants of the row examined. In 1912, there were 82 lines grown from plus selections made in 1911, i. e., from plants whose yield was above the average of their respective pure parents. Likewise there were 74 rows from minus selections made in 1911. The 82 plus selections showed an average plus deviation of 9.02 gm. per plant, that is to say, each plant weighed on an average, 9.02 gm. more than the parent plant selected in 1911.

On the other hand, on the 74 rows from the minus selections, the average minus deviation is 5.92 gm. per plant.

Of the 82 first lines there were 44 rows with a total plus deviation of 58.42 gm. while the 38 other rows had a total minus deviation of 42.53 gm. There is thus a difference of 15.89 gm. due to selection.

Im the same way, of the 74 second lines, 41 showed a total minus deviation of 53.33 gm, and the other 33, a total plus deviation of 37.62 gm. viz., a difference of 15.71 gm. due to selection.

There is therefore apparently a decided effect of the selection made in 1911 upon plants grown in 1912, but in the writer's opinion, it is rather a physiological than a genetic effect. It is possible that the larger, and consequently more vigorous plants, produce grain which has more nourishment, or which for some other reason, gives the new plant a better start. In fact, in the 2nd year, 1913, the effects of the selection in 1911 were already less, and in 1914, they had completely disappeared. Further, the plus selections showed a deviation in the direction opposite to the selection, just as the minus selections gave rise to individuals with higher yields.

In 1914, of the 84 lines produced from the seed of individuals selected in 1911 for their greater productivity, 38.5 gave a total positive deviation of 50.88 gm, while the 45.5 others showed a total negative deviation of 56.84 gm, or a negative difference of 5.96 gm.

On the other hand, of the 94 lines of plants of low yield 49 gave a total negative deviation of 61.04 gm. and the remaining 45 a total positive deviation of 66.91 gm, or a positive difference of 5.87 gm.

Thus, in the 3rd year; selection which was practised with the intention of obtaining increasingly productive, or increasingly unproductive, types respectively, produced exactly the opposite results.

If the positive effects of the selection of small fluctuations in the 1st generation were due to a true change in the germ plasm, the results obtained would be evident after 2 or 3 selections in the same direction, where — as the exact opposite is the case.

Height of plants. — The analysis of the selections for height of plants shows the same results as were found for grain yield. Table II sets forth the effect of the 1911 selection of the taller, or shorter, individuals belonging to the 1912, 1913 and 1914 generations.

Conclusion. — The writer concludes from the data obtained from these experiments, which lasted for 3 years and were based upon, and controlled by, biometrical laws and formulae, that the selection of fluctuations leads to no positive results.

TABLE I. — *The effects of the 1911 plus and minus selection (for grain yield) in the three succeeding years. Deviations in gms*

		Selected Plants		Daughter Row			
				+ Selections		— Selections	
		+	—	+ Deviations	— Deviations	+ Deviations	— Deviations
1912	Number of rows	82	74	44	38	33	41
	Total deviation	739.88 gm	437.93 gm	58.47 gm	42.53 gm	37.62 gm	53.33 gm
	Average deviation per row	9.023 gm	5.919 gm	1.328 gm	1.119 gm	1.14 gm	1.301 gm
1913	number of rows	126	132	53	73	58.5	73.5
	Total deviation	1 272.71 gm	821.60 gm	58.38 gm	56.24 gm	54.03 gm	56.19 gm
	Average deviation per row	10.101 gm	6.824 gm	1.102 gm	0.77 gm	0.924 gm	0.765 gm
1914	Number of rows	64	54	38.5	45.5	45	49
	Total deviation	909.88 gm	590.18 gm	50.88 gm	56.84 gm	66.91 gm	61.04 gm
	Average deviation per row	10.832 gm	6.279 gm	1.337 gm	1.249 gm	1.487 gm	1.246 gm

TABLE II. — *Effect of the 1911 selections for Height of Plant upon the Rows in each of the three succeeding years. Deviations in centimetres.*

		Selected Plants		Daughter Row			
				+ Selections		— Selections	
		+	—	+ Deviations	— Deviations	+ Deviations	— Deviations
1912	Number of rows	86	70	44	42	35	35
	Total deviation	393.35 cm.	420.53 cm.	180.65 cm.	146.00 cm.	121.77 cm.	136.39 cm.
	Average deviation	4.574 cm.	6.008 cm.	4.105 cm.	3.952 cm.	3.478 cm.	3.897 cm.
1913	Number of rows	130	120	61	69	71	55
	Total deviation	566.58 cm.	607.12 cm.	277.19 cm.	267.13 cm.	249.56 cm.	258.50 cm.
	Average deviation	4.356 cm.	5.059 cm.	4.544 cm.	3.872 cm.	3.515 cm.	4.700 cm.
1914	Number of rows	76	102	34	44	52	50
	Total deviation	335.07 cm.	736.39 cm.	117.45 cm.	125.61 cm.	194.54 cm.	189.31 cm.
	Average deviation	4.409 cm.	7.121 cm.	3.454 cm.	2.991 cm.	3.741 cm.	3.786 cm.

232 - **A Genetic Study of Plant Height in *Phaseolus vulgaris*.** — EMERSON R. A., in *Bulletin of the Agricultural Station of Nebraska*. No. 7, pp. 3-73, fig. 16. Lincoln, 1916.

In *Phaseolus vulgaris* the habit of growth, the number of internodes, and the length of the internodes, are 3 characters which are correlated with one another and with the height of the plant.

In a series of crossing experiments carried out with the greatest care

at the Agricultural Experiment Station of Nebraska (United States), the writer has studied the nature and behaviour of these characters to the third generation of hybrids. GROWTH HABIT — Common beans are of 2 distinct types with respect to habit of growth: they are either determinate, or indeterminate. In the former type, the growth of the plant ceases on the development of a terminal inflorescence and the number of internodes never exceeds 8; while in the latter, the flower clusters are inserted laterally in the nodes, and the growth of the axis is terminated only by accident, unfavourable surroundings, the drain of seed production and the like. For the sake of simplicity, the terms "bush" and "pole" are substituted for "determinate" and "indeterminate".

If we assume that the character of indeterminate growth is due to the presence of a factor (*A*) and the character of determinate growth to the absence of this factor (*a*), then as every individual is due to the fusion of the sexual elements of both parents, the pole beans may be represented by the formula *AA* and the bush beans by the formula *aa*.

On crossing *AA* with *aa*, we shall obtain for the hybrids of the F_1 generation, the formulae *Aa*, or *aA*. What will be the behaviour of these hybrids? We might theoretically predict that they would be intermediate, that is to say, plants of determinate growth, in which, however, the terminal inflorescence would appear much later, not till from 15 to 20 internodes had been formed. But, on the contrary, all the 981 individuals of the F_1 generation, showed the indeterminate type of growth. Thus *A* is dominant as regards *a*.

The examination of the hybrids of the 2nd generation confirms what has been said above. For, if *A* and *a* were equally potent, the fusion of *Aa* with *aA* would produce: *AA*, *aA*, *Aa*, *aa*, that is to say $^1/_4$ of the descendants would be like one parent, $^1/_4$ would be like the other, and $^1/_2$ would be of intermediate character. From 1 104 F_2 (2nd hybrid generation) plants, the writer, however, obtained 832 indeterminate and 272 determinate in growth, a ratio of 3.01 : 0.99, which is very near the theoretic ratio of 3 : 1. It can be said then, by way of conclusion, that in *Phaseolus vulgaris*, indeterminate and determinate habits of growth constitute a simple mendelian character-pair with indeterminate habit completely dominant.

LENGTH OF INTERNODES. — On crossing the pole bean, "Snowflake", (average length of internodes 22.5 ± 0.32 mm.) with the bush bean, "Tallbush", (average length of internodes 44.76 ± 0.93 mm.) the internode length of the hybrids of the F_1 generation was distinctly intermediate (29.62 ± 0.59 mm.), while in the F_2 generation it was very variable, but always within the extremes of the parent plants. On the other hand, the height of the F_1 plants was by no means intermediate between the parents, nor was the F_2 range in height confined to the parental extremes. In

other words, in the F_2 generation, some of the plants were shorter, and others taller than either of the parents. It appears a clear inference from these data, that a tall race of bush beans (like "Tallbush"), which inherited its relatively great height from a tall pole-bean parent of an earlier cross, has transmitted tallness to its pole-bean progeny of the F_2 generation when crossed with a very short pole-bean (like "Snowflake"). Other factors for height of plant are, then, inherited independently of habit of growth.

NUMBER OF INTERNODES. — The observations made on this subject have led to the same conclusion as the study of the length of the internodes. The genetic factors concerned in the determination of number of internodes in bean plants are distinct from factors for habit of growth and are inherited independently. It is possible, from a cross between a pure strain of bush beans and a pure strain of pole-beans to isolate types both of bush and poles-beans with other internode numbers than those of the parent races. There are thus, at least, 3 factors influencing the height of the plant of *Phascolus vulgaris* and though they can be trasmitted independently of one another, they necessarily influence one another during the development of the plant. But the action of the factor *A* is dominant and suppresses the factors *B*, *C* etc., of which the effect is only seen in the variations occurring in the F_2 generation. A combination of the multiple-factor and the single-factor hypotheses best interprets and explains the phenomena treated above. If we adopt the single-factor theory and try to interpret according to it the varjation in the F_2 hybrids, we shall be obliged to admit that the potency of this factor can be modified and remodified in the most different and inadmissible ways, while on the other hand, the theory of multiple-factors cannot explain the mendelian regularity of the segregation of characters in the F_1 and F_2 generations.

233 - **Some Recent Investigations in Sugar-Beet Breeding in the United States.** — PRITCHARD, J. FREDERICK, in *The Botanical Gazette*, Vol LXII, No. 6, pp. 423-465, XXXII Tables, 51 fig., Chicago, Illinois, December 1916.

The selection and improvement of sugar-beets based on the determination of the roots with the highest sugar content is a task requiring a large amount of analytic work. This is shown by the records of a single European beet-seed Company which analyses over 300,000 individual beets a year. It has, however, apparently been assumed upon theoretical grounds that a high percentage of sugar tends to be transmitted, without regard to the possibility of its being a fluctuating character and therefore not transmissible.

The writer has tried by means of numerous researches and experiments, to establish a more economical method of selection based on the selection of characters and on a more exact knowledge of the principles and laws of heredity.

The material employed consisted of:

(1) An American variety of sugar-beet known as « Morrison's Kleinwanzleben ».

(2) An unnamed variety obtained at Madison by making selections from 11 foreign varieties (« Madison Original Selections »).

(3) Five South Dakota varieties bred for several years at Brookings.

(4) An old well-established European variety « Kleinwanzleben's Original ». This variety is very uniform, most highly bred and very widely used and was employed by the writer for the purposes of control and comparison.

Most of the data given in the graphs, except where it is specially stated, refer to " Morrison's Kleinwanzleben ".

CORRELATION BETWEEN SEED YIELD IN MOTHER BEETS AND THE SUGAR CONTENT OF THEIR PROGENY. — Positive correlation between extractable sugar and seed yield would constitute a very desirable relation ship, as it would permit of the two characters being combined in a single

TABLE I. — *Correlation between the seed yield of the mother root- and the Sugar Content of the succeeding Generation.*

Seed yield of the mother-beets (from 25 to 25 g).

Sugar Content of Descendants (from 0.5 to 5 %)	162.5	187.5	212.5	237.5	262.5	287.5	312.5	337.5	362.5	387.5	412.5	*No. of descendants*
13.0	1	1										2
13.5	4	1		1								6
14.0	3	1	1	3	3			1				12
14.5	9	5	1	1		2						18
15.0	6	2	4	2	1							15
15.5	10	9	5	4	1							29
16.0	3	8	2	3			1	1			1	19
16.5	8	3	3	2	1							17
17.0	3	1										4
17.5	1	1			1							3
Totals of descendants	48	32	16	16	7	2	1	2	0	0	1	125

TABLE II. — *Correlation between the Mother Beets and Their Progeny from the Point of View of the following characters: Percentage of sugar – amount of sugar per root – Weight of root.*

Characters compared	Coefficients of correlation		
Percentage of sugar in mother root Average percentage of sugar in progeny	(1908–1910)* — 0.149 ± 0.067	(1912–1914) — 0.090 ± 0.076	
Amount of sugar in mother root Amount of sugar in progeny.	(1908–1910) 0.092 ± 0.050	(1906–1908) — 0.100 ± 0.088	(1907–1909) 0.104 ± 0.044
Weight of mother root Average percentage of sugar in progeny	(1906–1908) 0.168 ± 0.086	(1908–1910) 0.055 ± 0.054	
Weight of mother root Amount of sugar per root in progeny	(1908–1910) 0.092 ± 0.055	(1906–1908) — 0.115 ± 0.087	
Weight of mother root Average weight of root of progeny	(1908–1910) 0.022 ± 0.056	(1906–1908) — 0.095 ± 0.089	

* Of the two dates in brackets, the first refers to the mother-beet and the second to its progeny.

type and gradually improved. On the other hand, a negative correlation would lead to selection of roots with small seed yield. What is of importance is not so much the correlation of these two caracters in the mother beet, as the correlation between the seed yield of the mother root and the sugar content of the succeeding generation. A glance at table I (page 3 6) shows that the percentage and quantity of sugar varies in an irregular manner. There is therefore no correlation between the above mentioned characters, so extensive selections may be made for freer seed production without danger of sugar deterioration.

TRANSMISSION OF SELECTED QUALITIES OF MOTHER ROOTS. — The selection of mother roots for the purpose of starting a new family of beets, or improving one already established, is usually made upon the basis of size, shape and percentage of sugar. Little is so far known as to the transmission of these characters. In the early period of beet breeding they appeared to improve through selection, but this was at a time when the material was very variable and full of distinct physiological species. Now, the poorer physiological species have been eliminated and the few good varieties characterised by size, shape and sugar content have been retained.

The result of this selection is, that all varieties are now very much alike; moreover such root characters as size and sugar content, are markedly influenced by the environment, which causes considerable fluctuations that are not transmitted. Table II (page 367), which gives a summary of the biometrical data regarding the abovementioned characters, shows that there is no correlation between percentage of sugar, weight, or sugar content of the root and the average value of the same quality in its progeny. In fact, the poorest roots make as good progeny records as the best roots. Therefore the customary practice of selecting mother roots by current physical and chemical means is no more effective, and is a much more costly method than taking roots at random.

TRANSMISSION OF CHARACTERS OF SELECTED FAMILIES. — Average root weight, and average sugar percentage are the two characters deciding the relative value of families of beets grown under identical conditions. But these characters are easily modified by external agencies, and the fluctuations greatly exceed the real differences between sugar-beet families, so that it appears impossible for the characters of each family to be transmitted.

The results of numerous data collected by the writer are as follows:

1) From the point of view of the percentage of sugar there is no correlation between the individuals of 2 successive generations as this example shows:

	Average percentage of sugar in beet root families	Coefficient of correlation
In 1912.	14.07 ± 0.063	0.229 ± 0.072
In 1914.	31.61 ± 0.074	

2) From the point of view of the amount of sugar per root, there is also no correlation between successive generations:

	Average amount of sugar per root in beet families (in ounces)	Coefficient of correlation
In 1908.	2.33 ± 0.014	0.031 ± 0.060
In 1910.	3.69 ± 0.042	

3) There is no appreciable correlation between the average weight of root of the parents and the average percentage of sugar in their descendants.

		Coefficient of correlation
Average weight of root in ounces in beet families in 1906 . .	18.8 ± 0.391	0.056 ± 0.091
Average percentage of sugar in beet families in 1908 . . .	21.7 ± 0.077	

4) From the point of view of the average root weight there is no correlation in succeeding generations.

	Average weight of root (in ounces) in beet families	Coefficient of correlation
In 1908.	10. 74 ± 0. 067	— 0. 003 ± 0. 059
In 1910.	20. 57 ± 0. 261	

We are not justified by these facts in concluding that no real differences in yield and quality occur, however, as real differences may be obscured by fluctuations. The most we can say at present is that family differences of this character, as determined by current field methods, are not permanent.

DETERIORATION FROM LACK OF SELECTION. — There is a current belief that sugar-beets deteriorate in percentage of sugar when selection is discontinued, but this has not been proved satisfactorily. A *gradual decrease* for a limited period is not necessarely indicative of *permanent reduction*, as such environmental factors as sunshine, temperature, rainfall, time of planting, fertility of the soil, drainage and cultural methods, all vary in different years and these variations affect the percentage of sugar, which

TABLE III. — *Comparison of Morrison's selected mother beet seed with Morrison's commercial seed.*

Morrison's Selected Mother-Beet Seed				Morrisons' Commercial Seed			
Row number	No. of beets in row	Weight of row of beets (in pounds)	Percentage of sugar in beets	Row number	No. of beets in row	Weight of row of beets (in pounds)	Percentage of sugar in beets
2	68	46. 5	15. 0	3	67	43. 5	15. 9
4	68	37. 0	15. 0	5	65	32. 5	15. 2
6	60	39. 5	15. 2	7	62	37. 0	15. 4
8	72	40. 0	15. 1	9	70	39. 5	15. 5
10	62	38. 0	15. 2	11	72	43. 0	15. 3
12	82	47. 0	14. 9	13	69	36. 5	15. 7
14	85	49. 5	15. 0	15	57	33. 0	15. 7
16	74	45. 0	14. 9	—	—	—	—
Averages	71. 4	42. 8	15. 0	*Averages*	66	38. 0	15. 5

may fall for 2 or 3 consecutive seasons, and then rise again under more favourable conditions.

If sugar-beets deteriorate from lack of selection, commercial seed should produce poorer roots than the seed of selected mothers. In order to decide this question, a comparison was made in 1913 by mixing seed of highly selected families of Morrison's " Kleinwanzleben " and planting it beside the commercial variety of the same stock. The results are given in Table III (Page 369). In every case the commercial seed produced the roots richest in sugar, but they were somewhat smaller than roots from the seed of selected mothers (average difference 11.79 gm. per plant), but this is equivalent only to about 0.03 per cent sugar, while the average difference obtained was 0.5. Thus the commercial seed appeared to improve.

From these observations it may be concluded that continuous selection of variations in no way improves the useful characters of the beet-root, since these differences are mere fluctuations, due to external causes, and are therefore not transmissible.

234 — **Production of Seed of Sugar Beet in Russia.** — I. Production of Sugar Beet Seed in Russia by selection of seeds produced in the country, in Приложенія къ представленной въ министерство Земледѣлія докладной запискѣ Правленія Южно- Русскаго Общества Поощренія Земледѣлія и Сельской Промышленности по вопросу о мѣрахъ къ обезпеченію Россіи свекловичнымъ посѣвнымъ матеріаломъ. (*Appendices to the Report presented to the Ministry of Agriculture by the Direction of the Society of Southern Russia for the encouragement of agriculture and agricultural industries, on the question of providing Russia with sugar beet seed from local picked sources*), pp. 1–164. Kiev, 1916. — II. (Kriotkov, N. A.), Sugar Beet Seed in Russia, in Земледѣльческая Газета (*The Agricultural Gazette*, No. 38 (154), pp. 1018-1020. Petrograd, 1916. — III. Present state of plant-breeding in the Government of Podolia, in Подольскій Хозяинъ (*The Podolian Agriculturist*), No. 78, pp. 17–22. Vinniza, 1916.

I. — According to this Report, the world's production and consumption of sugar beet seed for the last few years has been as shown in Table I.

The above table shows that the production of commercial sugar beet seed is essentially concentrated in two countries; Russia and Germany, and their united production represents 9/10ths of that of the whole world.

Table II gives an idea of the development of this branch in Russia. It has been compiled by the Department of Customs and relates to the period 1900–1913; in addition to the total figures, those for Germany and Austria are also given. According to this table, Russia who, at the beginning of the period 1900–1913 imported sugar beet seed, has now become an exporter.

If the two principal characters only of the sugar beet be considered, sugar content and sugar production per unit of area, 3 periods may be

TABLE I. — *World's production and consumption of commercial seed of sugar beet.*

	Production	Consumption
Germany	573 300 quintals	147 420 quintals
Russia	365 270	286 650
Austria	49 100	131 640
Holland	4 900	14 740
France	8 190	57 330
Denmark	2 460	8 190
Belgium	—	13 100
Italy	—	13 100
Spain	—	12 280
Sweden	—	6 550
Roumania	—	4 900
Switzerland	—	290
Serbia	—	980
Bulgaria	—	1 310
England	—	410
America	—	81 900
	1 003 220 quintals	780 790 quintals

TABLE II. — *Russian trade in seeds of sugar beet from* 1900 *to* 1913.

Year	Imports: Quantity of grain in thousands of quintals (1) Total	Germany	Austria	Imports: Total value in thousands of francs (2)	Exports: Quantity of grain in thousands of quintals (1) Total	Germany	Austria	Exports: Total value in thousands of francs (2)
1900	45	36	7	1 806	2	0.5	1	119
1901	36	32	4	1 420	4	0.6	3	170
1902	36	31	4	1 350	2	0.8	2	178
1903	18	16	4	617	3	1.3	16	127
1904	18	15	2	481	3	3	1	125
1905	11	7	3	420	9	2	8	952
1906	7	5	2	473	3	0.5	3	111
1907	9	5	4	356	4	0.6	3	109
1908	8	5	2	270	4	0.7	3	149
1909	21	14	6	566	50	9	40	1 917
1910	7	4	2	276	29	6	23	1 407
1911	11	5	2	524	178	29	146	23 530
1912	9	5	—	728	99	28	71	12 456
1913	10	—	—	835	126	—	—	9 905

(1) 1 quintal = 1.96 cwts.
(2) 1 franc = 9 $^{1}/_{2}$ d at par.

distinguished in the history of the production of this plant. This results from experiments made on various varieties of beet from 1892 onwards by the Sugar Industry Section (Warsaw branch) of the Society for the encouragement of industry and commerce and continued by the Union of Sugar Refineries of the Kingdom of Poland.

The 1st *period:* from 1880–1898, may be regarded as that of the normal, organic development of the national production of sugar beet in Russia. The number of growers who employ good seed increases yearly and imported seed is slowly replaced by the selected Russian product. For instance, in the Kingdom of Poland, where, in 1892 the amount of seed employed which was produced in the country was 20 %, the proportion of imported seed used being 80 %. In 1897, the proportion of national seed used was 50 %. However, towards the end of the first half of this period (approximately 1894), under the influence of a strong propaganda by interested persons, the opinion gradually gained ground that the Russian seed was superior to the remainder merely on account of the very favourable climatic conditions in South-west Russia where it is produced. The confusion engendered by this propaganda resulted in the disappearance of the distinction previously made between home grown selected and unselected seed. In consequence, twice the amount of seed that was necessary was thrown upon the market. Prices fell so low that the firms seriously concerned with the production of sugar beet seed were no longer able to continue what they had undertaken in this direction.

The 2nd *period:* from 1898 to 1907 is marked by the appearance of foreign firms in Russia, and particularly by that of a big German firm, which, by introducing the reproduction of seeds from sorts selected outside Russia and disposing of a large capital, rendered the position of the few Russian firms still more difficult.

In the production of commercial seed the foreign firms adopted two methods: 1) they made special contracts with the Russian sugar refineries, supplying them with seed which these latter undertook to reproduce themselves according to the methods laid down by the said firms. The refineries then paid according to the crop obtained and at prices previously arranged; 2) they supplied seed to farmers, paying them in advance at a fixed price per quintal subsequently taking the whole of the commercial seed obtained. In this way, during the 2nd period the Russian sugar beet market was completely in the power of and dependent upon foreign firms. The market was filled with various types of native seed and by third rate foreign seed, to the serious detriment of the Russian sugar industry.

The 3rd *period:* from 1908 to 1914 marks the changing round of the

opinion of the public in favour of picked Russian seeds, experiments having shown that these latter are equal in quality to foreign seeds (1).

At the present time the Department of Agriculture, the sugar refineries and in some cases the zemstvos and leading firms as well, are taking measures to increase the production of picked Russian seed in order to satisfy home need and those of exportation also.

At the close of the 3rd period, the purely Russian production of sugar beet seeds rose from 74 000—90 000 quintals, whereas at the beginning of the same period it did not surpass 50 000 quintals. This production represents about 30 % of the total Russian consumption. Native and foreign seeds of beets of generally lower sugar content are responsible for 20 to 25 % and foreign seeds of good quality (though not superior to the best Russian) represent 50 %.

II. — KRIOUKOV insists on the necessity for organising on a large scale, with the aid of the Dept. of Agriculture, the production of prime quality Russian seed. He also advises the starting of trials, with sugar beet in Turkestan in order to study the effect of the climate of this region upon the plant, especially with regard to the sugar content.

III. — The results of an enquiry held by the provincial zemstvo of Podolia into the state of plant breeding in this province. Among other matters reference is made to the chief firms interested in the selection of sugar beets.

235. **Test of the Cultural Value of Vetch Seeds being Residues from Milling, in Hungary.** — See No. 280 of this *Bulletin*.

236. **The Determination of the Weight of Seeds per Unit Volume: Official Method and Apparatus Adopted in the United States.** — See No. 271 of this *Bulletin*.

(1) With regard to the varieties of sugar beet cultivated in Russia, Prof. D. N. PRIANICHNIKOV, in the 5th edition of his *Text book of Agriculture* (Moscow, 1914), p. 73, says that these are not produced independently but are the result of acclimatisation and selection of western varieties, chiefly those of Vilmorin and of Kleinwanzleben. However, the number of breeding stations has begun to increase in Russia also (according to KUDELKA, 60 at the end of the 19th century in South-east Russia), although recently their situation has become more difficult owing to the increasing demand for foreign seed. The causes of this phenomenon are not altogether clear as the climatic and soil conditions are undoubtedly favourable to the production of beets with high sugar content (it would be somewhat difficult in Russia to effect an increase of the production), and, further, there are signs that foreign seeds do not germinate so readily or strongly as Russian seeds. The reason for this is that they are evidently less resistant to the disease known as Wurzelbrand and to other enemies of the sugar beet. (*Ed*).

237 - **Improvement of Ghirka Spring Wheat in Yield and Quality.** — CLARK, ALLEN J., in *U. S. Department of Agriculture, Bulletin* No. 450, 19 pp., 7 fig. Washington, D. C., December 4, 1916.

A demand for hardier and more drought-resistant wheats was created with the progress of settlement of the drier portions of the Great Plains area. In response to this demand, the United States Department of Agriculture began about 1898 to improve the wheat crop of that area by the introduction from eastern and southern Russia of varieties which were thought to possess hardiness and drought resistance. To determine the value of these varieties they were tested at agricultural experiment stations in different localities in the Great Plains area. The principal economic result of this work was the introduction of Kharkof winter wheat and Kubanka durum wheat (See: CARLETON, M. A. "Hard wheats winning their way" in *U. S. Department of Agriculture, Yearbook* 1914, p. 391-420, fig. 22-25, pl. 35-41. Washington, 1915).

Some of the other varieties obtained were found of value for dryland areas. Among them was the Ghirka Spring wheat, which was both productive and drought resistant, but comparatively low in milling value. Its improvement in yield and quality is the subject of the present paper. The results obtained lead the writer to the following conclusions:

Ghirka Spring wheat has proved adapted to the northern part of the Great Plains area of the United States. The variety is susceptible to rust in moist seasons and in humid areas, but it has proved to be a valuable drought-resistant wheat.

Tests at seven experiment stations in the northern Plains area, covering a period of seven years, have shown that on an average the Ghirka Spring has yielded more than the Rysting Fife and Haynes Bluestem common wheats, but less than the Kubanka durum wheat. The quality of the Ghirka, however, is inferior to that of these standard wheats.

Experiments are being made at the Dickinson (N. Dak.) substation to improve both the yield and the quality of the Ghirka wheat by isolating superior pure lines. Many pure lines have been tested, and among them certain selections have thus far proved superior to the others and to the original mass variety in both yield and quality. They also compare favourably with the standard spring wheats of the Great Plains area in quality as well as in yield. The selections are also proving valuable material for crossing with varieties possessing greater rust resistance and high quality of grain.

From the data given it is shown that improvement in yield and quality is possible from pure-line selection and that good results are being obtained.

238 - **Trials of Foreign Varieties of Wheat in Spain.** — L. FIGUEROLA BALLESTER, « Araldo del Reno » wheat, in *El Agricultor, Revista mensual de Agricultura*, Year X, No. 11, pp. 121-123. Riotorto, September 1916. — II. DE MAS SOLANES R., High cropping wheats. *Ibid.*, pp. 139-141, October 1916.

I. — Trials carried out at Casarot, Tarragona, in 1915-1916. The seeds were sown at regular intervals on land which had received a complete manuring with artificials. Germination and growth, favoured by the winter rains, were normal; stooling was thick and development very strong. The ears contained 70 to 80 grains, whereas those of local races only bear about 50, on an average; 2 lbs. of seed gave a crop of 105 lbs. Milling and breadmaking results were perfectly satisfactory.

The writer has observed that the grain harvested was not uniform but showed 2 quite distinct types: one with elongated grain and very pronounced longitudinal furrow; the other with round grains and only slightly marked furrow, of a lighter shade of yellow than the first type externally and whiter internally.

II. — The writer confirms the qualities shown by the « Araldo del Reno » variety in most parts of Spain, where it has been under trial for some years: high yield due to the immense size of the ear — resistance to bad weather — good quality flour. Particularly good results have been obtained in the Balearic Archipelago during the last season.

Among other foreign wheats tested by Spanish farmers, the following possess good qualities: « Atlante », particularly suitable for rich soils, and « Tartaria », an early type and easily suited.

Sown at the end of October or in November it ripens at the beginning of July.

239 - **The Growth and yield of the Millets *Panicum miliaceum* and *Setaria italica* in Russia and their Relationship with Meteorologica Factors.** — See No. 221 of this *Bulletin*.

240 - **Growing of Early Season Potatoes from Sprouts** (1). — CAZORET, ARTHUR in *Le Progrès agricole et viticole*, 34th Year, No. 3, pp. 66-67. Montpellier, Jan 21, 1917.

For the production of early season potatoes, the writer recommends the method of planting by means of sprouts. Tubers are chosen with big eyes and placed in a dark store-room heated to 77°-95° F. When the sprouts are some 6 inches in length a certain amount of light is allowed to enter. In this way the sprouts will acquire a special greenness which will enable them to withstand subsequent transport and manipulation. They are then planted at a depth of 4 inches, 2 or 3 sprouts in each hole, spaced 8 × 20 inches apart.

(1) See also B. 1916, No. 639.

The results obtained in the granitic soils of the Ardèche are summarised in the appended Table. Trials in the Isère and Loiret in 1916 gave entire satisfaction. The advantages of this method are: considerable economy of seed; a gain of 10 to 15 days in the process of maturation.

Growing of Early Season Potatoes from Sprouts.

Year	Length of sprout	Number per hole	Spacing	Yield in lbs per acre
1907	30 cms. (11-8 ins.)	1	50 × 30 cms.	7 135
1908	30 » »	1	60 × 60 »	7 136
»	30 » »	2	60 × 60 »	8 028
»	30 » »	3	60 × 60 »	8 251
»	30 » »	4	60 × 60 »	6 244
1909	10 » (3-9 ins.)	3	30 × 50 »	12 488
»	20 » (7-9 ins.)	3	30 × 50 »	15 164

241 — ***Danthonia semiannularis* and *D. pilosa*, Plants Used in Pasture Formation in New Zealand.** — COCKAYNE, A. H. in *The Journal of Agriculture*, New Zealand Department of Agriculture, Industries and Commerce, Vol. XIII, No. 5, pp. 352-355, 2 fig., Wellington, November 20, 1916.

The two species of *Danthonia* that are used in pasture formation in New Zealand are *D. semiannularis*, and *D. pilosa*. They are "composite" species, that is to say, They really consist of a large number of strains, and are therefore very variable. Thus, while in some localities the dominant form yields a large amount of herbage, in others, owing to its tussocky development, and the rapidity with which its leaves dry up, the dominant form is of comparatively little use. From this, it will be seen that in seed harvesting it is necessary to gather from areas where the grass has produced a serviceable pasture.

The writer has calculated that the number of seeds per pound averages 550,000 for *D. pilosa* and 900,000 for *D. semiannularis*. The seedling of the former is more vigorous than that of the latter, so that for seeding purposes a pound of *pilosa* can be looked upon as equal to a pound of *semiannularis*.

D. semiannularis has the longer leaves, and the plant is more erect and tussocky, not tending towards the production of a close sward. *D. pilosa* forms a comparatively close sward and, when kept short, produces a large amount of fairly succulent herbage.

In the early days of the use of *Danthonia* in New Zealand, *semiannularis* was chiefly grown, but owing to the advice of the Department of

Agriculture, *pilosa* is now generally employed, as it is far the superior form for general purposes. *D. semiannularis* is still used in scrubby "manuka" (*Leptospermum scoparium*) and fern country, where after sowing, burning from time to time is necessary, as it carries a fire so much better than *D. pilosa*.

Much second and third class country in New Zealand originally sown with rye, and cocksfpot (*Dactylis glomerata*), as well as much of the original lowland tussock (*Poa australis*) sheep-country, is now almost pure *Danthonia* pasture. The plant either sowed itself there naturally, or the seed was carried thither in the fleeces of sheep. The development of this type of pasture has been a great advantage. *Danthonia*, however, is not advised for rich land, but only for soils where rye-grass and cocksfoot will not succeed. Another point to be considered is that it is never sown on ploughed land, except under special conditions, such as pumice country, but is practically always sown on the ashes on third class forest land, or on burnt scrub, or fern country.

The best time to sow is from the end of January to the end of March. On poor land, where the best grasses do not hold more than a few years, it is now customary to include from 2 lb. to 6 lb. of *Danthonia* in the mixture. On country originally sown with English grasses, but which has been invaded by fern and "manuka" (*Leptospermum scoparium*) from 12 lb. to 16 lb. of *Danthonia* per acre shonld be sown mixed with some cheap grass like "Yorkshire fog" (*Holcus lanatus*): but such large amounts are rarely used. Owing to the high price of *Danthonia* seed, less is sown than is advisable. The plant develops fairly slowly, so that it is necessary to mix it with other grasses to cover up the land rapidly. When once established, however. *Danthonia* spreads rapidly, and if kept well down, it forms excellent sheep pasture, but in the autumn it often gets hard, dry and long, and in this case it should be grazed by cattle.

Danthonia stands frost well; it is not suitable for hay; it responds very well to top dressing, especially if phosphates are used. Areas should be shut up for seed about the end of October and the seed harvested in January. Good lines should germinate over 80 per cent, but an average germination of 50 per cent can be considered satisfactory. Owing to the fluffiness of the seed, machine-cleaning is out of the question, and the sowing is always done by hand.

242 - **A Sowing Date Experiment With Egyptian Cotton.** — BALLS, LAWRENCE W., AND HOLTON, F. S. in *Philosophical Transactions of the Royal Society of London*, Series B., Vol. 206, pp. 403-480. London 1915.

Experiment made at Giza in 1913, for the purpose of determining the effect of the sowing-date upon the chief stages of plant development which influence yield. Nine sowings were made on the following dates: February

15 and 22; March 1, 8, 15, 22, 29; April 5 and 12. The bolls were gathered 3 times; on September 10, October 1 and November 5.

The data of the harvest are given in Table I and show the following facts: 1) To delay sowing until after March 15 has always a bad effect upon the quality, as well as the quantity, of the crops; 2) on the other hand, if the sowing is done before that date, no special advantage is gained, and in some cases harm results.

This last statement is contrary to the general opinion of agricultural experts in Egypt which tends rather to planting early, but it proves the wisdom of the fellaheen cultivators, who in the Giza district sow their rice between March 10 and 15.

Data of sowing	Number of bolls gathered from each plant at the			Total	Date of ripening of the first 5 bolls
	1st picking	2nd picking	3rd picking		
Feb. 15.	6.17	4.87	3.72	14.75	Sept. 2
» 22.	7.32	5.97	3.14	16.43	Aug. 30
March 1.	6.82	4.53	3.39	14.72	» 31
» 8.	7.36	4.89	3.11	15.35	» 30
» 15.	6.85	5.93	3.21	16.00	» 31
» 22.	5.70	5.46	3.69	14.88	Sept. 3
» 29.	4.85	5.00	3.38	13.20	» 9
April 5.	3.07	5.18	4.12	12.39	» 13
» 12.	2.38	4.39	4.05	10.80	» 18

The optimum sowing date in the Giza district is thus March 15. Early sowing is not favourable to flowering or bolling and often occasions uneven germination.

The writer is of opinion that these facts are due to insufficient absorption of water on the part of the plant and probably to the production of toxins which accumulate in the growing cells and hinder the development of the various organs. Since, in order to obtain normal development in the cotton plant, it is necessary to sow practically at a constant date which cannot be anticipated, the question arises as to the factor which has a depressant effect upon the early seedlings.

The temperature of the soil is the only factor whose seasonal variations are practically uniform from year to year. We should note that the development of the lateral roots does not take place until the tap-root is some 15 cm. long, and that the time at which this length is attained is longer the cooler the temperature of the soil. Until the lateral roots begin to form, water is absorbed with difficulty and the above-mentioned toxins are produced.

Moreover, independently of the absorbant surface, which increases with the growth of the lateral roots, the amount of water absorbed increases with the rising temperature. Absorption in the roots of the cotton plant is negligible below 10° C. Towards the middle of March, the temperature conditions are such that:

1) In the same number of days, the later-sown plants develop a larger root system than the earlier-sown plants.

2) The root system is absorbing water more rapidly.

Further north than Giza, the soil temperatures are lower; the optimum sowing date should therefore probably be later than March 15. This conclusion is supported by the data furnished by H. H. Prince Omar Pasha Toussoin. The converse should obtain further south.

The optimum sowing date not only depends upon latitude and altitude, but also upon the soil. It might differ in two adjoining fields, if the surface soil of one were sandy and in the other of heavier texture, since these would change their temperature at somewhat different rates.

243 - **Cotton Growing Prospects in the French Colonies, Results in Algeria.** — *Comptes Rendus des Séances de l'Académie d'Agriculture de France*, Vol II. N° 36, pp. 1031-1038; N° 41, pp. 1207-1210. Paris, Nov. 22 and Dec. 27, 1916.

France imports every year 400 million francs worth of cotton from the United States, India and Egypt; her cotton industry employs 300 000 workers. The whole of the raw material could be produced in the French colonies, either on 5 900 000 acres of unirrigated land or on 2 965 000 acres of irrigated land.

The problem of cotton cultivation is now being studied in Morocco, the Sudan, Senegal, Dahomey. In the last-named country a variety of cotton plant has been discovered, not native, but one which has become adapted to the country. The fibre produced is neither long nor silky but belongs to the " woolly " type of cottons and so may be worked in company with wool for certain mixed tissues. The valleys of the Senegal and Niger offer immense stretches of territory where cotton might be cultivated provided the necessary irrigation work was carried out.

During the American War of Independence, the department of Oran (Algeria) was a large producer of cotton, but its cultivation was subsequently totally abandoned. Since 1904 attempts have been made to restart it.

The Colonial Cotton Growing Association has been carrying on propaganda work in this same department, by distributing seed, building ginning factories at Oran and providing facilities for the sale of the crop.

M. F. GODARD has begun an experimental cotton plantation at the Philippeville School of Agriculture and has obtained most encouraging results. It has been shown that, contrary to the general opinion, cultivation

on unirrigated land is possible over large areas in Algeria. In 1906, trials were made by various agriculturists along the Algerian and Tunisian littoral. In 1908, three cooperative ginning societies were founded at Philippeville, Bône and Orléansville. Wherever cultivation has been carried out under normal conditions, results have been profitable. It is now admitted that medium staple (Mit-Afifi) and short staple (Mississippi type) cottons from Algeria spin very satisfactoryly.

The Governor General of Algeria is taking an interest in cotton growing in the colony and has begun selection work with the object of producing improved seed.

244 – **Rubber Investigation at the Central Rubber Station.** — VRIES O. DE in *Mededeelingen van het Centraal Rubberstation*, N°. 1. Batavia 1916.

In the first part of the present paper the writer deals with the methods in use for rubber testing at the Central Rubber Station at Buitenzorg.

By means of the curves drawn on the Schopper machine the rubber is judged in regard to:

1) the type of the curve;

2) the time of cure, necessary to bring the rubber to the right state of cure, i.e. the curve to the right position;

3) tensile strength, load at breaking in kg. per sq. mm;

4) length at breaking, final length in % of original;

5) length at a certain load, for which 1.30 kg per sq. mm is generally chosen. This is very convenient for expressing the relative position of the stress-strain-curves and for judging of the uniformity in rate of cure.

The results are given and graphically demonstrated in tables, obtained from one homogeneous lot of rubber vulcanised a number of times; in fact it was used as a control–sample for every separate vulcanisation. The big number of testings so obtained enable the position of the stress-strain-curve and breaking point to be fixed with great accuracy.

The results are discussed of the combined sulphur insoluble in acetone, calculated on the total vulcanised mixture. The points lie in a straight line; this agrees with the more elaborate investigations of SPENCE YOUNG (Kolloid Zeitschrift 11,28 and) GOTTLOB (Gummi Zeitung 30, 303).

Chapter II gives an illustration of the work which the Central Rubber Station is doing for estates. Lack of uniformity still seems to be the chief fault of plantation rubber. On the other, hand the testing of estate-samples is not of the least value as long as it is not known in how far a sample from one day or from one case has, practically speaking, the same qualities as samples from other days or from other cases of the same grade. Before starting work of this kind it is therefore necessary to get an insight into the degree of uniformity of the product now shipped by the contributing estates.

The results obtained from an estate on which the rubber is very uniform are shown, notably in rate of cure, the samples having all been cured for 2 hours with 7 ½ % S (calculated on the mixture) at 148° C.

The results of another estate show a different aspect; the samples, in this case all cured for 2 ¼ hours with 10 % S at 140°, are far from uniform, and the estate in question is now changing its methods of preparation in order to reach the desired degree of uniformity in product.

Chapter III gives some preliminary observations on the influence of temperature and sulphur-content on the vulcanisation.

Some data obtained at 148° are compared with those after vulcanisation during double the time at 140°. The curves in nearly all cases coincide approximately, so that one may conclude that the rate of cure at 148° is double that at 140°. This agres with the results of SPENCE, (Kolloid Zeitschrift 11, 28) who found the temperature-coefficient in these regions to be 2.67. For a comparison of testing results at different laboratories one has also to take into account the time used for heating till the temperature of vulcanisation is reached, and later for cooling till a temperature at which the vulcanisation practically stops, so that in practice results obtained at 148° do not always show double the time of cure of results at 140°.

The results are discussed obtained by curing mixtures with different percentages of sulphur; the curve lies lower with increasing sulphur-content, indicating that the vulcanisation proceeds more rapidly as the amount of sulphur present increases.

Other figures show the tensile strength and the length at breaking of some of these mixtures after different cures. With 7 ½ and 10 ½ sulphur a definite maximum in tensile strength is reached, whilst with 5 % sulphur even after 4 ½ hours cure the tensile strength still increases. This shows that for testing purposes the percentage of sulphur in the mixture must be taken higher than 5 %. Similar results were some time ago published by GOTTLOB for mixtures of Para rubber, sulphur and vulcacite as an accelerator (Gummi Zeitung 30, 326).

The product load length at breaking point for different percentages of sulphur has been investigated by the writer.

A comparison is made between the time of cure for mixtures with 7 ½ and 10 % sulphur. To bring the curve into the same position a mixture with 7 ½ % suphur must be cured approximately 1 ½ times as long as a mixture with 10 %.

245 - **The Rubber Industry in Malaya.** — *Gouvernement Général de l'Indo-Chine, Bulletin Economique de l'Indo-Chine*, Year 19, No. 17, p. 121. Hanoi-Haiphong, January-February 1916.

The phenomenal increase in rubber-growing in Malaya is shown by the figures for the last 10 years:

Year	Amount	Price per lb.	Total value in £
1906.	430 Tons.	5 shillings	£ 240 800
1907.	885	4 1/2	» 446 040
1908.	1 629	4	» 729 892
1909.	3 340	7	» 2 618 560
1910.	6 504	6	» 4 370 688
1911.	11 500	4	» 5 172 000
1912.	21 305	4	» 9 548 900
1913.	35 352	3	» 11 872 000
1914.	50 404	2 1/4	» 12 700 000
1915.	68 500	2 1/2	» 19 180 000

Thus the Malay States, whose great wealth up to the present has been tin, with an export worth on the average £ 7 613 000, have now in their rubber plantations a much more important source of wealth, since the value of the production in 1915 is worth over 19 million pounds sterling.

246 - **Observations in Java on the Mould attacking Sheet Rubber.** — ARENS P., in *Mededeelingen van het Proefstation Malang*, N° 13, pp. 3-9. Soerabaja, 1911.

The writer has studied cases where sheet rubber, after having been packed for occasionally quite a short time, has become covered with mould due to a growth of Ascomycetes (*Penicillium*, *Aspergillus*, etc.).

It is important that all utensils used in the coagulation and transport of latex should be kept thoroughly clean.

The same applies to the racks in the drying sheds from which the sheets are suspended.

The sheets should be quite dry before being packed and only thoroughly dry wood should be used for making packing cases. Sheets attacked by mould may be disinfected with a 3 % solution of chinisol.

247 - **The Effect of Cultural and Climatic Conditions on the Yield and Quality of Peppermint Oil.** — RABAK FRANK, in *U. S. Department of Agriculture Bulletin* No. 454, 16 pp. Washington, December 9, 1916.

The value of the peppermint (*Mentha piperita*) oil depends much on its composition. The principal ester constituent, menthyl acetate, possesses a very fragrant minty odor, to which the agreeable aroma of the oil is largely due. The alcoholic constituent, menthol, possesses the penetrating

minty odour and characteristic cooling taste. The flavoring properties of the oil are due largely to both the ester and alcoholic constituents, while the medicinal value is attributed to the latter only. The elaboration of these constituents depends upon the various cultural climatic conditions to which the plant is subjected during growth.

In order to obtain data bearing on possible variations in the composition of peppermint oil under varying conditions, the following points were studied by the writer, of the Drug-Plant and Poisonous-Plant Investigations Division of the Bureau of Plant Industry of the U. S. Department of Agriculture: Effect of soil and climate on the composition of peppermint oil; yield of oil from fresh and from dry plants at various stages of growth; physical and chemical properties of peppermint oil from fresh and from dry plants at various stages of growth; effect of light and shade; effect of frost action.

From the results obtained the following conclusions are drawn:

Conditions of soil and climate are influential factors in the formation of oil and its constituents in the peppermint plant. Light sandy or loamy soils appear to be most favorable for the production of an oil of high quality.

The yield of oil distilled from fresh plants apparently decreases as the plant matures (See Table I). Drying the plant before distillation results

TABLE I. — *Yield of peppermint oil from the fresh and from the dry herb at various dates of distillation and stages of growth during five successive years (1908-1912).*

		Average Per cent *
Fresh herb	budding	0.134
	flowering	0.132
	fruiting	0.114
Dry herb	budding	0.066
	flowering	0.050
	fruiting	0.040

* Calculated on the basis of fresh herb.

in a considerable loss of oil. The largest proportion of oil is found in the leaves and flowering tops (See Table II).

The percentage of esters in the oils increases as the plants approach maturity. The content of menthyl acetate of the oils varied in the budding plant during the several seasons 1908-1911 from 6.72 to 16.67 per cent,

TABLE II. — *Comparison of yields of peppermint oil from the fresh leaves, from the tops, and from the whole fresh herb at different stages of growth during three successive years.*

		Average Per cent *
Whole herb	budding	0.116
	flowering	0.113
	fruiting	0.133
Leaves	budding	0.203
	flowering	0.303
	fruiting	0.120
Tops	budding	0.173
	flowering	0.233
	fruiting	0.153

* Calculated on the basis of fresh herb.

in the flowering plant from 7.07 to 14.5 per cent, and in the fruiting plant from 12.37 to 20.86 per cent.

The menthol content of the oil bears a close relationship to the ester content.

In many cases when the ester content is high the free menthol content is low, and vice versa. This relationship is but natural, as the higher the percentage of menthol in combination in ester form the lower is the percentage of free menthol. The oils with the highest content of total menthol are those which contain the highest content of free menthol and also combined menthol, or ester.

The free acidity and ester content of the oil distilled from dry plants is considerably higher than in the oil from fresh plants. The drying of the plants causes changes favorable to esterification, while the percentage of free and total menthol in oils distilled from dried plants in also uniformly high.

The formation of esters and menthol takes place most readily in the leaves and tops of the plant, the metabolic processes showing increased activity as the plant matures.

The effect of shade upon the peppermint plant is to decrease esterification and the formation of menthol, and is due possibly to the lessened activity of the alimentation of water by the plant.

The action of frost noticeably increases esterification and the formation of menthol.

248 - **Trials on the Cultivation of the Opium Poppy by the Bezentchouk Agronomic Station in the Province of Samara, Russia.** — KOULTCHIZKIJ JA. P., in Земледѣльческая Газета (*The Agricultural Gazette*), No. 37, (152), pp. 975–976. Pietrograd, 1916.

The Bezentchouk Agricultural Experiment Station has been engaged, since the spring of 1916, on experimental work in the cultivation of medicinal plants. The results obtained with the opium poppy have just been published.

The white and blue *Papaver somniferum* was sown on April 19 in lines 35 cms apart on 3 plots measuring 81, 45 and 36 square meters respectively; the first seedlings appeared on April 28, and on May 18 the plants were thinned, a space of 10–16 cms being left between each. Flowering began on June 2; the tapping of the capsules was begun on July 5 and terminated on the 23rd of the same month. At the time the tapping of the capsules was begun the average height of the plants was 130 cms and there were about 4 capsules per plant.

For making the incisions a very simple form of knife was devised. Two "Gillette" razor blades were fixed to a flat strip of wood 4 mms apart so as to project 2 or 4 mms. Both longitudinal and transversal incisions were made, the latter giving the better results.

The work of tapping was begun towards 4 o'clock in the evening and the solid exudate collected the following morning in small glass tubes. The latex was then weighed and forwarded to the laboratory for extraction of the morphine. In all, there was collected: from the 1st plot 45.5 gr – from the 2nd 39.9 gr – from the 3rd 35 gr of crude opium, containing 28 % of water and 12 to 18 % of morphine. Calculating the average morphine content at 15 %, the amount of dry opium obtained would be 6 kg of dry opium per hectare (5.35 lbs. per acre) and about 90 gr of morphine.

Although these trials were only of a tentative character, they have sufficed to show that the cultivation of the opium poppy is possible in the Province of Samara, and they have also demonstrated the quantity of morphine obtainable. Whether or not this province is best adapted from the economical point of view can best be settled when the data from similar trials in other parts of the Russian Empire are available.

249 - **Culture and Forcing of Witloof Chicory.** — WELLINGTON J. W., in *New-York Agricultural Experiment Station, Geneva, N. Y., Bulletin* No. 418, pp. 89–98 + 3 plates. Geneva, March 1916.

Witloof chicory, an improved variety of the common chicory *Cichorium intybus* Linn., is little grown in America as a salad plant, but of wide and extended use throughout Europe. Its culture has attained great importance and perfection in Belgium and France, from whence

large quantities were imported to America previous to the war. In the belief that this vegetable can be grown and forced profitably by American gardeners, the New York Agricultural Experiment Station, Geneva, N. Y., is conducting investigations relative to its production.

It has been found that plants may be easily grown from seed in the Geneva environment.

Roots having a crown diameter within the limits of one to two inches produced the greater number of marketable heads.

Sand proved to be a very satisfactory medium with which to cover the forcing roots, in that it is easily obtainable, blanches the leaves perfectly and promotes the formation of compact heads.

Temperatures averaging 56° and 61° F. were found satisfactory in producing a marketable crop. It is evident that a range of 50° to 60° F. is approximately the optimum.

The size of head was in accordance with the size of root used, as may be seen from the following table.

Relation of Forced Heads of Witloof Chicory to Roots, in Weight and Quality.

Size	Number	Total Weight of heads	Average Weight of heads	Percentage of marketable heads
Extra	22	7 lbs 2 ozs	5.18 ozs	50
Large	54	11 8	3.40	72
Medium	52	5 1	1.56	73
Small	44	2 9	0.93	41

The length of time required for forcing the crop was 15 days, showing that several crops might be grown in the same soil during a winter season.

The harvest produced at the Station was acceptable in quality and appearance and much superior to the foreign product in flavor and in freshness.

250 – ***Martynia proboscidea*, a Vegetable which Should be more Extensively Grown in the United States.** — Rosa J. T. Jr, in *The Country Gentleman*. Vol. LXXXI, No. 53, p. 2231. Philadelphia, December 30, 1916.

Martynia proboscidea, which is commonly known in the United States as " devils' claw ", or " pickle with a nose ", is a native of the arid

southwest, but it makes a luxuriant growth in the moister and cooler parts of the country; it is very susceptible to frost.

The pods are round, 5 to 8 inches long and are covered with short, soft down: they should be picked for use either as pickles, or for green vegetables, while they are small and green, for upon maturity they become tough, turn brown, split open and discharge the ripe seed. The plants grow very fast, and a few seeds sown in hills three feet apart in the open, after all danger of frost is over, will produce pods in less than 6 weeks, and continue to fruit until frost cuts down the plants in the autumn. During this long season an immense quantity of fruit is produced.

In the middle Western States, large quantities of *Martynia proboscidea* are grown for pickling. The pods are worthy of more extensive use as a green vegetable, and the plant itself is ornamental.

251 - **New Experiments in Pruning Apple Trees in Oregon, United States.** - GARDNER V. R., MAGNESS J. R. AND YEAGER A. F., in *Oregon Agricultural College Experiment Station, Division of Horticulture Bulletin* 139. pp. 1-88 + XXII Plates Corvallis, Oregon August, 1916.

I. *Early Summer Pruning of Young Apple Trees.* — Experiments carried out in 1912 at the Oregon Experiment Station on 313 trees, the varieties being Wagener, Yellow Newtown, Jonathan and Grimes. The records of growth under the varying pruning treatments include number and length of shoots, shoot diameter, trunk circumference, number and distribution of fruit spurs.

The data relating to shoot growth indicate that, on the average, the unpruned tree increases in size a little more rapidly than the tree that is winter-pruned only, or that is both winter and summer pruned. The difference in growth is, however, very small. The summer-pruned trees lose more shoot growth from pruning, but they produce nearly enough to compensate for the additional loss. The amount of shoot growth produced any one season by young apple trees that have not yet developed many spurs, is closely correlated with the amount they made the preceding season and shows little correlation with the severity of their winter pruning.

In the same way, the amount of shoot growth shows little correlation with the severity of the summer pruning. There seems to be a close correlation between increase in trunk circumference at any period during the summer, and the leaf area possessed by the tree at that particular time.

In some varieties, heavy early summer pruning has the effect of causing those shoots remaining after the pruning to thicken and become more stocky. In other varieties, the shoots in the trees that are winter pruned only are the thicker and stockier. In all the varieties studied, the late shoot growth formed after the summer pruning is comparatively slender.

The summer pruning practised in these experiments affords a direct stimulus to spur formation. Some of the buds on the basal portions of the shoots that are left after the summer pruning almost invariably grow into fruit spurs during the latter part of the summer. Those that remain dormant during the latter part of the summer, are just as apt to develop into spurs the following year, as similarly situated buds on shoots that are not summer pruned.

The late summer shoot growth of the summer pruned trees is very productive of fruit spurs the season following its formation. A high percentage of its buds develop into spurs. Herein, apparently, lies the chief gain in fruit-spur production from the summer pruning. On the trees that are winter pruned only, there is no growth to correspond to it. There is little or no relation between the severity of the summer pruning, and the number of spurs to each unit of shoot length that remains.

Summer pruning of the type described, affords a means of developing a fruit spur system in young apple trees earlier than is possible with the ordinary method of winter pruning only. It is estimated that its judicious use with varieties bearing mainly upon spurs, will enable the apple grower to bring his trees into bearing approximately a year earlier, and still maintain and develop a good framework.

Summer pruned trees show a tendency to mature their wood a little later in the autumn; they have not, however, proved more susceptible to bark splitting caused by severe winter weather.

II. *The Influence of Summer Pruning on the Bud development in the Apple.* — A study of the influence of summer pruning upon apple bud development under Western Oregon conditions, warrants the following statements:

The method and season of spur fruit bud differentiation and development was found to be identical with that described by previous investigators. Spur leaf buds developed during early summer, but little occurred later than July in those varieties investigated. Axillary buds developed very rapidly for a time following their initial formation, then grew slowly until about the time shoot growth ceased.

Initial development of axillary fruit buds occurred about one month later than in spur buds on the same trees. The main differentiation took place during late August and September. The method of development of axillary fruit buds seemed to be exactly like that of spur fruit buds However, they followed spur buds in point of time of differentiation, and never entirely caught up with them.

The difference between axillary buds in general and buds on spurs, in general, seemed to be in degree of development, rather than in method. The influence of the early summer heading back could be detected in the number of fruit buds formed on established spurs.

Early summer heading back tended greatly to reduce the number of fruit buds formed on one year wood.

Leaf buds on pruned shoots, both on the primary and secondary growth, were not visibly influenced by the pruning. They appeared to function like similarly located buds on unpruned shoots.

This, coupled with the fact that the form of the summer pruned shoot, which allows many axillary buds to be left at the time of the following winter pruning, accounts for the greatly increased number of spurs in trees that have received regularly an early summer heading back.

III. *A Statistical Study of the Fruit-Spur System of Certain Apple Trees.* — This statistical study was made on 2000 fruit spurs of " Grimes, Yellow Bellflower " and " Domine ". As a general rule, the percentage of spurs which flowered decreased more or less rapidly with age, depending on the variety. The percentage of spurs bearing fruits decreased much more rapidly than the percentage blooming. On the average, spurs decreased in amount of fruit to each bearing spur as they became older, though the more vigorous of the older spurs produced more than the average of the younger spurs. Among spurs of uniform age, there was a marked degree of correlation between their length and production. This correlation was more pronounced as the spurs became older. There was considerable correlation between the amount of growth that a spur made one year and its production the following year. The average " Grimes " spur grew more during the year that it produced fruit, than the year it was not fruiting. Spurs bearing 2 years in succession averaged somewhat less to each spur the second season, than other spurs that bore no crop the first season.

There was a high degree of correlation between the diameter of spurs and their production. This was practically the same for old spurs as for young.

Spurs of the same age borne on branches of large diameter bore a larger amount of fruit than those on smaller branches.

In the " Grimes " tree studied, the largest average production for each spur was found in the south quarter. The upper part of the tree produced more to each spur than the lower, and there was a slightly greater production for each spur on the outside of the tree than on the inside. Wherever the average production for each spur was less than the mean, the average age was more.

252 **Good Hybrid Direct Bearers Cultivated in France** (1). — Pee-Lary E., in *Revue de Viticulture*, 23rd Year, Vol. XLV, No. 1173, pp. 405-409. Paris, December 21, 1916.

The accompanying list of direct bearers contains numbers the chief characters of which are great fertility and regularity in bearing. They

(1) See also B. 1916, No. 185. (*Ed.*)

have already given proof of their capacity in these respects, having been in cultivation for the last fifteen years at least. The writer, by whom they are recommended, is chief lecturer at the University of Toulouse.

Hybrids with black grapes: Seibel No. 1020 — Seibel No. 1077 — Seibel No. 1000 — Seibel No. 1070 — Seibel No. 2003 — Seibel No. 138 — Seibel No. 4121 — Seibel No. 2859 (rose hybrid) — Malegue No. 8296 (does well in the moist regions of South-west France).

Hybrids with white grapes: Seibel No. 793 — Seibel No. 880 — Seibel No. 2653 — Seibel No. 3021 — Seibel No. 4681 — Gaillard-Girard No. 157.

253 - **The Chemical Composition of American Grapes Grown in the Central and Eastern States.** — ALWOOD WILLIAM B., in *United States Department of Agriculture, Bulletin* No. 492, 20 pp. Washington, D. C. December 18, 1916.

This report is supplementary to the writer's account of the American grapes grown in the States of Ohio, New York and Virginia: Alwood William, B., Enological Studies, No. 4: The Chemical Composition of American Grapes Grown in Ohio, New York and Virginia in *U. S. Department of Agriculture, Bureau of Chemistry, Bulletin*, 145. Washington, 1911.

The results of the analyses are given in 2 tables. The data are arranged by localities, and the average, maximum and minimum results are given when more than one sample was taken for each locality: a total average of all the analyses of each variety is given, with maximum and minimum results as to solids, sugar and acid on all the samples of any given variety examined. The specific gravity determined by a pycnometer at 15-6° C is given individually for all single samples and the average is given where two or more samples are recorded for any locality. There were 171 analyses made. In table 3 are set forth the results for sugar and acid determinations of all the varieties, with a few exceptions, examined from 1908 to 1911 and in 1913. A summary of these data is given in the following table, where the maximum and minimum results are recorded for the same variety in the different States of North America.

Composition of American Grapes.

Variety	Sugar as invertase gr. in 100 cc. of juice	Acid as tartaric gr. in 100 cc. of juice	Acid-sugar ratio
Adirondac	10.19	0.911	1 : 11.2
Agawam	15.28 a 19.02	0.840 a 1.344	1 : 11.4 a 1 : 22.3
Amber Queen	16.02	1.436	1 : 11.2
America	16.94	1.436	1 : 11.8
Aminia	16.68	0.821	1 : 20.3
Bacchus	17.42 a 20.51	1.205 a 1.852	1 : 9.8 a 1 : 17.0
Barry	12.12	1.159	1 : 10.5
Belle	18.78	1.114	1 : 16.9
Big Extra	13.91	1.466	1 : 9.5
Black Eagle	17.57	1.011	1 : 17.4
Brighton	17.67 a 20.47	0.632 a 0.822	1 : 21.2 a 1 : 32.4
Brilliant	18.71	0.676	1 : 27.7
Brown	13.64	1.106	1 : 12.3
Butler N° 1	17.03	0.833	1 : 20.4
Campbell Early	13.61 a 15.56	0.540 a 0.884	1 : 17.4 a 1 : 27.0
Canada	14.60	1.028	1 : 14.2
Carman	13.29	1.654	1 : 8.0
Catawba	16.22 a 20.78	0.709 a 1.552	1 : 10.4 a 1 : 28.0
Champion	11.90	0.915	1 : 13.0
Chatauqua	13.50	1.043	1 : 12.9
Clevener	13.08 a 14.96	1.196 a 2.285	1 : 10.6 a 1 : 12.5
Clinton	17.73 a 21.62	1.081 a 2.130	1 : 8.9 a 1 : 18.4
Cloete	16.02	1.088	1 : 14.7
Colerain	12.76	0.870	1 : 14.7
Concord	14.08 a 18.51	0.466 a 0.888	1 : 18.5 a 1 : 37.3
Conqueror	12.98	1.074	1 : 12.1
Corby	13.77	0.938	1 : 14.7
Creveling	13.93	1.000	1 : 13.8
Croton	11.84	0.788	1 : 15.0
Cynthiana	19.10 a 21.23	0.707 a 1.598	1 : 12.0 a 1 : 27.7
Daisy	16.95	0.653	1 : 20.0
Delago	17.25	1.009	1 : 17.1
Delaware	18.06 a 25.80	0.467 a 1.809	1 : 10.7 a 1 : 54.1
Diamond	16.52 a 17.48	0.634 a 1.058	1 : 15.6 a 1 : 24.4
Diana	18.80 a 20.27	0.950 a 0.986	1 : 19.1 a 1 : 21.0
Diogenes	14.23	1.599	1 : 8.9
Dutchess	16.78 a 18.02	0.586 a 0.734	1 : 23. a 1 : 28.0
Early Dawn	16.22	1.065	1 : 15.2
Early Golden	18.50	0.848	1 : 21.8
Eldorado	19.03	0.784	1 : 25.0

Composition of American Grapes.

Variety	Sugar as invertase gr. in 100 cc. of juice	Acid as tartaric gr. in 100 cc. of juice	Acid-sugar ratio
Elvira	13.57 a 17.16	0.735 a 1.288	1 : 11.0 a 1 : 20.9
Empire State	16.10	0.704	1 : 22.9
Etta	11.24	1.369	1 : 8.2
Eumelan	13.54 a 18.38	0.706 a 0.961	1 : 14.6 a 1 : 26.0
Franken Riesling	18.15	1.208	1 : 15.0
Franklin	18.41	1.188	1 : 15.5
Goethe	15.12	0.888	1 : 17.0
Goff	15.64	0.895	1 : 17.5
Gold Dust	15.71	0.694	1 : 22.6
Golden	17.04	0.420	1 : 40.6
Glenfeld	14.56	1.106	1 : 13.2
Green Early	14.21	0.758	1 : 18.8
Gutedel	20.20 a 20.36	1.144 a 1.350	1 : 15.1 a 1 : 17.7
Hayes	15.16 a 18.45	0.893 a 1.118	1 : 13.6 a 1 : 20.7
Hartford	15.81	0.893	1 : 17.7
Herbert	16.54	1.200	1 : 13.8
Herbemont	15.55	0.904	1 : 17.2
Hexamer	16.36	1.245	1 : 13.1
Hicks	13.32	1.159	1 : 11.5
Honey Dew	16.34	0.956	1 : 17.1
Illinois City	17.81	0.998	1 : 17.8
Iona	18.8 a 21.31	0.679 a 1.238	1 : 15.2 a 1 : 31.1
Isabella	13.91 a 16.97	0.645 a 1.228	1 : 13.8 a 1 : 26.3
Ires	11.80 a 16.84	0.519 a 0.917	1 : 15.0 a 1 : 31.1
Janesville	13.95	1.462	1 : 9.6
Jefferson	17.45	0.886	1 : 19.7
Jessica	19.70	0.450	1 : 45.8
Lenoir	14.90	1.540	1 : 9.6
Lindley	15.61 a 18.54	0.704 a 1.054	1 : 14.8 a 1 : 25.8
Lucile	14.46	0.865	1 : 16.7
Marion	17.31 a 20.77	1.566 a 1.718	1 : 11.1 a 1 : 12.1
Martha	16.07	0.840	1 : 19.1
Massasoit	15.21	0.754	1 : 20.2
Matfield	15.87	0.796	1 : 19.9
Millo	19.85	0.741	1 : 26.9
Missouri Riesling	14.30 a 19.13	0,636 a 0,941	1 : 16.8 a 1 : 28.5
Molitor	20.36	1.006	1 : 20.2
Montefiore	17.32 a 14.80	0.401 a 0.842	1 : 23.7 a 1 : 61.8
Moore Diamond	17.48	0.634	1 : 24.4
Moore Early	9.04	0.825	1 : 11.0

Composition of American Grapes.

Variety	Sugar as invertase gr. in 100 cc. of juice	Acid as tartaric gr. in 100 cc. of juice	Acid-sugar ratio
Moyer	17.61	0.711	1 : 24.8
Munson	13.57	1.490	1 : 9.1
Nectar	17.26	1.256	1 : 13.7
Niagara	13.14 a 18.92	0.448 a 0.822	1 : 16.2 a 1 : 42.2
Noah	14.25 a 20.25	0.750 a 1.632	1 : 8.7 a 1 : 27.0
Norton	17.67 a 25.27	0.867 a 2.212	1 : 9.1 a 1 : 25.1
Norfolk	16.10	1.144	1 : 14.1
Olita	15.97	0.908	1 : 17.6
Pierce	12.42	1.253	1 : 9.9
Pocklington	16.85 a 17.04	0.700 a 0.846	1 : 20.1 a 1 : 24.1
Prentiss	17.47	0.728	1 : 24.0
Regal	16.11	0.836	1 : 19.3
Regna	16.75	0.844	1 : 19.8
Roger	18.10	1.035	1 : 17.5
Rogers N° 24	13.19	1.238	1 : 10.7
Rogers N° 32	15.43	1.181	1 : 13.1
Rupert	13.28	1.756	1 : 7.6
St Louis	13.31	1.140	1 : 11.7
Salem	17.41 a 20.17	0.510 a 1.085	1 : 16.0 a 1 : 34.5
Schmidt	17.50 a 18.85	1.294 a 1.823	1 : 9.6 a 1 : 14.1
Seibel	11.10	1.852	1 : 6.0
Taylor	17.57	1.326	1 : 13.3
Telegraph	13.90	1.256	1 : 11.1
Tragedy	16.65	0.776	1 : 21.5
Triumph	11.09 a 14.09	1.012 a 1.354	1 : 10.4 a 1 : 11.0
Ulster	19.23	0.684	1 : 28.1
Vergennes	17.34	1.082	1 : 16.0
Wapanuka	9.42	1.084	1 : 8.7
Wilder	14.11 a 14.44	1.020 a 1.189	1 : 11.9 a 1 : 14.2
Winchell	19.28	0.506	1 : 30.1
Woodruff	13.54 a 14.34	0.409 a 0.660	1 : 20.5 a 1 : 35.1
Worden	13.12 a 17.24	0.709 a 0.908	1 : 14.2 a 1 : 24.3
Wyoming Red	13.29	0.805	1 : 16.5

LIVE STOCK AND BREEDING.

254 - Observations on Some Insect Pests of Livestock in the Belgian Congo. — ROUBAND, E. and VAN SAGEGHEM, R., in *Bulletin de la Société de Pathologie Exotique*, Vol. IX, No. 10, pp. 763-767. Paris, 1916.

Observations made at the State Veterinary Station, Zambi, Belgian Congo.

I. LARVAE CAUSING ANIMAL MYIASIS IN THE LOWER CONGO.

I. OESTRIDAE (Gastricolous). — Larvae of *Cobboldia loxodontis* and *C. chrysidiformis* were found in the alimentary canal of an elephant. The occurrence of the latter species in other regions of Tropical Africa is not definitely ascertained.

In the stomachs of asses of both sexes of the Lombardy and Poitou races, larvae were observed corresponding to the *Gastrophilus intestinalis* of Europe. Some of these reared in the laboratory gave adults closely resembling the *G. asininus* form distinguished by BRAUER and which the authors regard as a geographical variety of the *G. intestinalis* of Europe. Warble-flies have been introduced into the Lower Congo contemporaneously with the importation of foreign horses, and have become acclimatised.

They did not exist there originally owing to the absence of horses, either tame or wild.

MUSCIDAE. — Myiasis due to *Chrysomyia* (*Pycnosoma*) *bezzianum* Vill. = *megacephala* Bezzi, is often observed among cattle. Hitherto this myiasis had only been encountered among oxen and horses; at Zambi it is also found in pigs. It has also been observed on a young domesticated antelope (*Tragelaphus scriptus*). It seems therefore that in nature wild mammals must also suffer from this cause. In the cases observed at Zambi, the myiasis was always the result of complications deriving from wounds.

Larvae of *Lucilia argyrocephala* Macq. were collected on a Barbary duck and on a fowl. This parasite, which hitherto has only been recorded upon mammals and upon man, appears to be of wide occurrence even among birds. Larvae of *L. argyrocephala* and *Passeromyia heterochaeta* Vill. have been found in the nest of *Ploceus collaris*; apparently the myiasis caused by *L. argyrocephala* is the direct consequence of the previous parasitic action of the haemophagous larvae of *Passeromyia*.

II. BITING INSECTS AND ACARINI COLLECTED ON LIVE STOCK AT ZAMBI.

TABANIDAE. — *Haematopoda perturbans* Edw. (probable transmitter of *Trypanosoma cazalboni*), *Tabanus canus* Karsch; *T. dilaceriatus* Macq.; *T. pluto* Walk; *T. par* Walk; *T. biguttatus* W; *T. taeniola* P. B.

STOMOXIDAE. — *Stomoxys calcitrans*, common on live-stock; *Lyperosia pallidipes* occurring in large numbers on cattle.

PULICIDAE. — The "chigoe" of man, *Sarcopsylla penetrans* L. infests pigs to such an extent as to constitute a serious obstacle to their breeding. *S. gallinacea* infests poultry and cats.

LICE. — *Haematopinus suis* L., frequently occurring on native or imported pigs. *H. eurysternus* has been observed on cattle. *H. tuberculatus* Grib. var *penicillatus* has been collected on a buffalo imported from Italy; it has not been possible to determine whether this parasite is of European origin or not.

ACARINI. — *Psoroptes communis* var. *caprae*, on goats, cattle and domesticated rabbits. The authors regard this parasite as having been introduced from Europe, similarly *Dermanyssus gallinae*, *Cnemidocoptes mutans* (common on poultry) and *Chorioptes equi* Her. (on the horse).

IXODIDAE. — Among ticks collected on animals at Zambi the following have been identified:

Rhipicephalus appendiculatus Neumann; *Rh. simus* Koch and *Rh. capensis* Koch; *Amblyomma variegatum* Fabr. and *A. splendidum* Giebel; *Margaropus annulatus* Say; *Amblyomma tholloni* Neumann has been collected on an elephant from Kassai. The human tick, *Ornithodorus moubata*, has been encountered in large numbers on the pig at Paso Kondé (between Boma and Zambi); a search for spirillae on these *Ornithodorus* has given negative results. moreover "tick fever" is non-existent in the locality. *O. moubata* on the pig has already been recorded by WELLMANN in Angola (1).

255 - **Studies on Contagious Abortion in Mares.** — COMINOTTI LUIGI in *La Clinica Veterinaria*, Year XXXIX, No. 24, pp. 705-716. Milan, December 30, 1916.

Contagious abortion usually develops in regions where breeding of selected races is carried on, and occurs more especially in imported mares. In European countries it is chiefly recorded in Holland and Belgium and in the Italian provinces of Cremona and Mantua, *i.e.* in those parts where horse-breeding is most developed.

It is in Belgian mares that this type of abortion is most frequently observed. It is unaccompanied by any observable phenomena, whether general or local. The writer has never observed any posthumous evidence to account for the abortion.

The foetus and foetal membranes have been submitted to bacteriological examination. Aerobic and anaerobic cultures of the various organs of the foetus have been prepared. The anaerobic cultures have always

(1) See also No. 216 of this *Bulletin*.

(*Ed.*).

remained sterile. The aerobic cultures have sometimes produced *Bacterium coli* and in other cases a staphylococcus has developed. The chief point of importance, however, has been the development, either alone or associated with one or both of the above organisms, of a bacterium related to *Bacterium coli* but not fermenting lactose. It shows the following characters:

Form coccobacillary.
Very motile.
GRAM negative.
Milk: non-coagulating.
Gelatine: non liquefying.
BARSIEKOW I (nutrose and glucose): fermented.
BARSIEKOW II (nutrose and lactose): non fermented.
HETSCH solution (nutrose and mannite): fermented.
PETRUSCHKY solution: first a faint red tinge, then blue.
DRIGALSKY agar: bluish colonies on blue ground
ENDO agar: white colonies on colourless ground.
Development of indol; nil.

In view of these proporties the microrganism most frequently isolated from aborted embryos must be placed in the sub-group *enteridis-paratyphum* B. The agglutination test with anti-swine fever serum gave agglutination at the maximum agglutination strength of the serum (1: 10 000).

With regard to the foetal membranes, a pure culture gave development of a streptococcus in one case only.

The writer has compared the strains of bacteria isolated with strains forwarded from the Royal Institute of Sero-therapy of Rotterdam and Utrecht isolated from aborted foetuses derived from different parts of Holland. The Dutch and Italian strains (Piadena, Prov. of Cremona) were identical.

In order to determine the reciprocal behaviour of the 3 strains with respect to their different immune serums, subcutaneous and endo-peritoneal inoculations were made on guinea-pigs with gradually increasing doses of cultures of the 3 strains: the animals were killed when the agglutination concentration reached 1: 2 000. Each of the 3 serums was then agglutinated by the serums of the 2 other serums at the same concentration as the corresponding serum.

Agglutination tests both with normal serum of mares and with the serum of mares which had aborted always gave negative results.

Inoculation of cultures of paratyphus *B* on pregnant ewes, either per vagina or mouth gave negative results. Similarly with endo-vaginal inoculation of guinea-pigs.

Attempts to establish the presence of the bacillus isolated from the foetus in the vagina of mares which had aborted a few days previously were also useless.

The frequency with which the bacillus of the sub-group *enteridis paratyphum B* has been isolated from the organs of the aborted foetus justifies the theory held by several writers that this bacillus is the specific agent of abortion in horses. The problem, however, cannot yet be considered as settled.

256 - **Injury to Ducklings Caused by the Larvae of the Coleopteron *Dermestes lardarius*.** — BURKHARDT, FRANZ, in *Berliner Tierärztliche Wochenschrift*, 33rd Year, No. 4. pp. 44-45. Berlin, January 25, 1917.

In May 1916, the " Kaiser-Wilhelm-Institut für Landwirtschaft " in Bromberg (Germany) received for examination several larvae of a Coleopteron found in the nests of ducks, where they were awaiting the hatching of the eggs. Immediately after the piercing of the shell, the larvae enter the egg and attack the duckling, even entering the body. Some 6-8 larvae per egg were so found. Chicken broods were not usually attacked.

Examination has shown the larvae to be those of the Coleopter *Dermestes lardarius*, which is of common occurrence in shops stocking smoked meat (ham and bacon).

The Coleopter, which is dark black in colour, measures 7-9 mm in length. The female lays her oblong eggs. of comparatively large size, on smoked meat, etc.

The larva develops rapidly and after several months reaches double the length of the adult beetle. The upper portion of the larva is brown in colour, the underside white, and it possesses 3 pairs of relatively short legs. The last segment has 2 processes on its dorsal portion in the shape of small backwardly recurved hooks. The covering of bristles of various lengths in especially characteristic.

The life-cycle in completed very rapidly, so that there may be several generations in a year. The insect passes the winter in the adult state.

The mode of life of the larva is similar to that of the adult, but the fact, recorded by the present writer, that it even attacks ducklings, was not known with certainty. The writer recommends further research and experiments on this subject.

257 - **The Valuation of Feeding Stuffs.** — PFEIFFER, E. in *Fühlings Landwirtschaftliche Zeitung*, Year 65, Part. 21-22, pp. 484-507. Stuttgart, November 1-15, 1916.

Among the 3 resolutions passed by the German Federation of Agricultural Experiment Stations, there occurs the remark that the idea opened up by MACH gives promise of success but requires more thorough examination. Up to the present this suggestion has found no echo; Prof. LAUR alone has submitted the resolutions of the Federation to a critical analysis. He agrees broadly with the proposals formulated, but

on several points of more or less importance is led to adopt a different view (1). The present writer therefore considers it opportune to review the whole question anew.

I. Estimation of compensation for Short Value.

Mach has proposed to determine in the ordinary analysis of feeding stuffs for live-stock, not only the crude protein and fats, but also the moisture and ash content (similarly the starch content), to calculate the starch value of the food-stuff under examination by the aid of average coefficients of digestibility and those of Kellner, and to use them as a basis for framing the guarantee supplied to the buyer. This new system is also supported by Prof. Laur, who considers that in various aspects it requires completion. Seeing that the albuminoids are no longer to be valued separately, while valuation is to be made of the nutritive constituents of the plants contained in the food, this fact should naturally be taken into account in calculating the compensation to be allowed in the fodder trade in case of difference between the content guaranteed by the seller and that found by the buyer. According to Prof. Laur, the best way to obtain this object consists in extending the guarantee to the nitrogen content of the food. The price of the kilo of nitrogen should in that case be fixed as far as possible by agreement between buyer and seller, according to whether pasture or arable land is involved, at 10-70 *pfennigs* (2) or, failing an arrangement of this kind, at 40 *pfennigs*. The writer thinks this latter method will prove to be the rule. He also considers that there is not sufficient motive in the estimation of the improvement for expressing the value of the manure directly. A supplement for the crude protein seems to meet the case better, and for the sake of simplicity the writer proposes to fix it at 10 *pfennigs* in round figures, a sum which is more or less intermediate between the values he recommends for the estimation of the manurial value of the nitrogen according to whether particular or average care is taken to prevent loss of nitrogen. These values are, respectively, $\frac{85 \times 80}{100} = 68$ *pfg.* or $\frac{85 \times 60}{100} = 51$ *pfg.* for the nitrogen and, in consequence, 10.9 *pfg.* or 8.2 *pfg.* for the crude protein (3).

The following example shows how the estimate of the amount of compensation would be effected in comparision with the old method.

On the basis of an analysis a merchant feels justified in guaranteeing for a poppy-seed cake 37 % of crude protein, 8 % of fat and 61 % of starch equivalent. But for one reason or another he supplies another cake for which the check analysis gives: 32.03 % crude protein, 5.65 % fat and 55.53 % starch equivalent. The price is 14.25 marks per metric quintal. According to the old method the compensation to pay would be:

$$(37 + 8) - (32.03 + 5.65) = 7.32 \times \frac{14.25}{45} = 2.32 \text{ marks.}$$

---

(1) See B. 1915, No. 1334.

(2) For the purpose of this article it will be sufficient to regard 10 *pfennigs* as equivalent to 1 penny and a *mark* as equivalent to a shilling. (*Ed.*)

(3) See *Die Landwirtschaftlichen Versuchsstationen*, Vol. 79-80, 1913, pp. 289 *et seq.*

According to the new method the calculation would be as follows:

For 4.97 % of crude protein too little at 10 *pfg.* per % . . . . . 0.50 *mark*
For 5.47 % of starch-equivalent too little at 17.3 *pfg.* per % . . . 0.95 *mark*

Compensation 1.45 *mark*

As may be seen from the above, the compensation to be paid according to the new method would be less, but this does not constitute a reason for rejecting it, as the effective deficit is established with more precision. Further, there is reason for hoping that in these conditions the trade would be more disposed to accept this new guarantee.

MACH himself is in doubt as to how his method would work with regard to foods with a high content of crude fibre, and especially in the case of attempted falsification with rice offals. In such cases the complete analysis of the food cannot give results capable of utilisation because it is impossible to take into consideration (at any rate, in a direct manner) the very different nutritive value of the pure feeds and of the substances employed for their falsification. The question appears in a still more unfavourable light where, for example, it is only wished to determine the moisture, ash, crude protein and fibre and to introduce into the calculation for the sum of fat + nitrogen free extract a factor derived from the composition of the pure food. The present writer has shown that MACH'S doubts are well founded.

It results that the method of calculation proposed by MACH is, in the majority of cases, capable of rendering excellent service in the valuation of pure feeding stuffs. But it fails in the presence of falsification by means of substances of low food value. Until, therefore, a method has been found of completing the process by means of a microscopical examination, its application will involve a certain amount of danger which it would be imprudent to ignore. MACH'S method, however, seems to form an excellent means of enlightening farmers as to the real nutritive value of the foods they buy. Further, by having recourse to microscopic analysis and to the determination of the crude fibre, it will be possible to estimate almost exactly the depreciation in value caused by falsifications.

II. VALUATION OF COMMERCIAL FEEDING STUFFS.

The resolutions passed by the above mentioned Federation are agreed to by LAUR who limits himself to proposing a few modifications concerning the valuation of the manure. The present writer concedes straight away that the taking into consideration of the phosphoric acid and potash contents of the foods cannot claim to be of decisive importance. According to LAUR'S table, however, the valuation of the feeding stuffs might be influenced by this factor, in extreme cases, to the extent of 1.73 *pfg.* per kg of starch equivalent. The writer considers that the completed method would naturally be too long for the calculation of compensation for short value. Notwithstanding, in the case mentioned, a single calculation only is involved, the results of which should be included in the tables with those intended for the valuation of the nitrogen. The amount of work involved is so small that, according to the writer, there is no reason to neglect it.

The writer does not agree with LAUR when he says « nitric nitrogen cannot as a general rule be taken as a standard of value for the nitrogen of food-stuffs, but in many cases recourse must be had to the nitrogen of green manure ». For, he says, one is obliged at the very start to admit that many farms which buy large quantities of concentrates

rich in albuminoids have also regular need of nitric nitrogen. Further, the nitrogen of green manure furnishes a less reliable value than that of nitric nitrogen. To this must be added the fact that a portion (varying considerably with the nature of the soil) of the nitrogen of green manure is not entirely bestowed gratis by the atmosphere, but is derived from the soil, whilst, on the other hand, the losses of nitrogen vary in an extraordinary manner according to the nature of the soil under which the green manure is turned. The case is very much the same with the nitrate, but the conditions with regard to this latter are much better known.

Finally, the writer harbours various doubts with regard to the proposal of LAUR to differentiate, in evaluating the manure, between the various types of stock farms. For the moment, however, there is no necessity to modify the resolutions of the Federation with regard to this point.

III. VALUATION OF FEEDING STUFFS NOT USUALLY APPEARING ON THE MARKET.

The German Federation of Agricultural Experiment Stations has decided that the calculation of the manurial value of feeding stuffs not intended for the market should be effected following the same principles as for the commercial kinds except, however, that account should be taken of the organic matter. LAUR opposes the inclusion of the phosphoric acid and of the potash, as well as the organic matter. The writer argues that if LAUR's point of view be accepted, the manurial value of rye-straw, for instance, is considerably reduced, especially if it is utilised as litter. If then, this straw is given as a ood to live-stock, it is possible, in certain conditions, that such utilisation may be expected to give greater advantages than are obtained by its employment as litter, and to a degree which the writer regards as inadmissible.

LAUR considers that the employment of the ordinary trade feeding stuffs as a basis of appreciation for feeding stuffs not occurring on the market, only rarely gives exact results. He proposed to employ, for instance, the market process of skimmed milk for the valuation of the foods richest in albuminoids, those of potatoes for other cultivated crops, these of meadow hay for dry fodders, etc. It is only in respect of cereal grains that he would allow the principles accepted for commercial feeding stuffs to stand. With regard to the above, the writer considers that: 1) very complicated situations would result; 2) it would entail the admission that the market prices of « Normal futtermittel » (normal feeding stuffs) were fixed values. The writer considers that these 2 points by no means constitute a step in advance but rather evoke considerable apprehension. Nor does the consideration of the degree of concentration, according to LAUR, meet with his approval.

Summing up, the writer admits that, where it is a case of the utilisation of feeding stuffs from the economical point of view, LAUR's method for the valuation of fodders not intended for the market offers several advantages. But, according to its own express statement the Federation of German Agricultural Experiment Stations only aims at fixing landmarks for the exact valuation of feeding stuffs not generally occurring on the market by comparision with the ordinary feeding stuffs of every day trade. And this special purpose is amply attained by the method proposed by the present writer. True, this process has the drawback of being a very long one but in this respect the method of LAUR shows no advantage.

358 - **Net Energy Values for Ruminants.** — ARMSBY, HENRY PRENTISS AND FRIES, J. AUGUST, in *The Pennsylvania State College, School of Agriculture, Agricultural Experiment Station, Bulletin* No. 142, 19 pp. State College, Centre County, Pennsylvania, July 1916.

HENRY and MORRISON (*Feeds and Feeding*, 15th. edition, Madison, Wis., pp. 633-666), have published a compilation of analyses of feeding stuffs and of the results of digestion experiments in North America, and on this basis have calculated the content of digestible nutrients (for ruminants) in a great variety of feeding stuffs. From these tables, the writers have computed the net energy values of the more important feeds in the manner which they had previously devised (1).

The results of their calculations are given in the following table, with regard to which it is to be remarked that: 1) Both the digestive coefficients used by HENRY and MORRISON, and the data for the expenditure of energy due to feed consumption are derived exclusively from experiments on ruminants. Consequently, the net energy values here computed are applicable to ruminants only, and not to horses, or swine; 2) the table shows primarily the net energy values for maintenance or fattening. There seems good reason for believing, however, that they may be taken to represent also the net energy values for growth and, at least, the relative values for milk production; 3) in comparing the figures for the various feeding stuffs, account should be taken of the moisture they contain when they are given to the animals; 4) HENRY and MORRISON'S tables include only the crude protein (N × 6.25). The amount of non-protein has been estimated by the writers from the crude protein on the basis of KELLNER'S averages.

Average Dry Matter, Digestible Crude Protein, Digestible True Protein, and Net Energy. Values per 100 lbs. for Ruminants.

	Dry matter	Digestible Crude protein	Digestible True protein	Net energy value
	Lbs.	Lbs.	Lbs.	Therms
DRIED ROUGHAGE:				
Hay and fodder from cereals:				
Brome grass, smooth	91.5	5.0	3.5	40.83
Corn fodder (ears included, medium dry)	81.7	3.0	2.3	43.94
Corn stover (ears removed, medium dry)	81.0	2.1	1.6	31.62
Millet, Hungarian	85.7	5.0	3.9	46.96
Mixed timothy and clover	87.8	5.3	3.2	41.07

(1) See *B.* 1913, No. 625. (*Ed.*)

	Dry matter	Digestible. Crude protein	Digestible. True protein	Net energy value
	Lbs.	Lbs.	Lbs.	Therms
Oat hay	88.0	4.5	3.9	32.25
Orchards grass	88.4	4.7	3.3	44.93
Red top	90.2	4.6	3.9	51.22
Timothy, all analyses	88.4	3.0	2.2	43.02
Timothy, before bloom	92.8	4.7	2.9	43.52
Timothy, early to full bloom	87.2	3.6	2.5	47.40
Timothy, late bloom to early seed	85.1	2.4	1.8	37.54
Timothy, nearly ripe	87.5	2.2	1.8	38.59
Hay and fodder from legumes:				
Alfalfa, all analyses	91.4	10.6	7.1	34.23
Alfalfa, before bloom	93.8	15.4	10.3	36.23
Alfalfa, in bloom	92.5	10.5	6.7	32.33
Alfalfa, in seed	89.6	8.5	6.2	32.23
Clover, alsike	87.7	7.9	5.3	34.42
Clover, crimson	89.4	9.7	6.9	36.21
Clover, red, all analyses	87.1	7.6	4.9	38.68
Clover, red, before bloom	89.6	11.6	5.4	42.17
Clover, red, in bloom	86.1	8.1	5.3	39.12
Clover, red, after bloom	77.9	6.8	4.5	34.51
Clover, sweet, white	91.4	10.9	6.7	38.98
Cowpeas, all analyses	90.3	13.1	9.2	37.59
Cowpeas, before bloom	92.2	17.8	12.8	33.54
Cowpeas, in bloom to early pod	89.4	12.6	9.5	39.11
Soybeans	91.4	11.7	8.8	44.03
Straws:				
Barley	85.8	0.9	0.6	36.61
Buckwheat	90.1	4.2	3.2	4.55
Oat	88.5	1.0	0.8	34.81
Rye	92.9	0.7	0.5	17.59
Wheat	91.6	0.7	0.3	7.22
FRESH GREEN ROUGHAGE:				
Green cereals, etc.:				
Barley fodder	23.2	2.3	2.0	14.08
Blue grass, Kentucky, before heading	23.8	3.7	2.8	14.32
Blue grass, Kentucky, headed out	36.4	2.8	2.2	17.77
Blue grass, Kentucky, after bloom	43.6	1.9	1.6	21.01
Buckwheat, Japanese	36.6	2.2	1.5	17.7[illegible]
Cabbage	8.9	1.9	1.3	8.1
Cabbage, waste outer leaves	14.1	1.7	1.1	7.8
Corn fodder, dent, all analyses	23.1	1.0	0.8	14.4
Corn fodder, dent, in tassel	14.9	1.1	0.8	9.5

	Dry matter	Digestible Crude protein	Digestible True protein	Net energy value
	Lbs.	Lbs.	Lbs.	Therms
orn fodder, dent, in milk	19.9	1.0	0.8	13.64
orn fodder, dent, dough to glazing	25.1	1.3	1.0	17.35
orn fodder, dent, kernels glazed	26.2	1.1	0.8	16.74
orn fodder, dent, kernels ripe	34.8	1.5	1.1	22.48
orn fodder, flint, all analyses	20.7	1.0	0.8	13.53
orn fodder, flint, in tassel	10.6	0.9	0.7	6.89
orn fodder, flint, in milk	15.0	0.9	0.7	10.39
orn fodder, flint, kernels glazed	21.0	1.0	0.8	13.49
orn fodder, flint, kernels ripe	27.9	1.2	0.9	17.84
orn fodder, sweet, before milk stage	10.0	0.8	0.6	7.82
orn fodder, sweet, roasting ears or later	20.3	1.2	0.9	13.38
orn fodder, sweet, ears removed	21.5	1.0	0.8	14.26
illet, Hungarian	27.6	1.9	1.1	17.24
at fodder	26.1	2.3	2.0	14.06
rchard grass	29.2	1.7	1.1	15.81
ape	16.7	2.6	1.7	13.07
ye fodder	21.3	2.1	1.4	15.99
weet sorghum fodder	24.9	0.7	0.4	15.37
imothy, before bloom	24.2	1.8	1.1	18.36
imothy, in bloom	32.1	1.3	0.8	18.89
imothy, in seed	46.4	1.5	1.0	26.36
heat fodder	27.4	2.8	1.9	18.75
Green legumes:				
lfalfa, before bloom	19.9	3.5	1.0	9.20
lfalfa, in bloom	25.9	3.3	1.8	11.50
lfalfa, after bloom	29.8	2.1	1.3	11.10
lover, alsike	24.3	2.7	1.5	14.56
lover, crimson	17.4	2.3	1.6	10.83
lover, red, all analyses	26.2	2.7	1.7	15.87
lover, red, in bloom	27.5	2.7	1.8	16.74
lover, red, rowen	34.4	3.3	2.2	17.30
ulpeas	16.3	2.3	1.7	10.42
as, Canada field	16.6	2.9	2.1	9.78
ybeans, all analyses	23.6	3.2	2.4	12.53
ybeans, in bloom	20.8	3.0	2.3	10.44
ybeans, in seed	24.2	3.1	2.5	12.70
tch, hairy	18.1	3.5	2.4	11.95
SILAGE:				
rn, well-matured, recent analyses	26.3	1.1	0.6	15.90
rn, immature	21.0	1.0	0.4	11.96
rn, from frosted ears	25.3	1.2	0.6	14.27
rn, from field-cured stover	19.6	0.5	0.3	8.98

	Dry matter	Digestible Crude protein	Digestible True protein	Ne ener val
	Lbs.	Lbs.	Lbs.	Ther
Clover	27.8	1.3	0.8	7.
Cowpeas	22.0	1.8	1.1	11.
Soybeans	27.1	2.6	1.5	11.
Sugar beet pulp	10.0	0.8	0.5	9.
ROOTS, TUBERS AND FRUITS:				
Apple	18.2	0.4	0.1	15.
Beet, common	13.0	0.9	0.1	7.
Beet, sugar	16.4	1.2	0.4	11.
Carrot	11.7	0.9	0.5	9.
Mangels	9.4	0.8	0.1	5.
Potatoes	21.2	1.1	0.1	18.
Pumpkin, field	8.3	1.1	0.6	6.
Rutabaga	10.9	1.0	0.3	8.
Turnip	9.5	1.0	0.4	6.
GRAINS:				
Cereal grains:				
Barley	90.7	9.0	8.3	86.
Buckwheat	87.9	8.1	7.2	59.
Corn, dent	89.5	7.5	7.0	86.
Corn, flint	87.8	7.7	7.2	87.
Corn and cob meal	89.6	6.1	5.7	75.
Corn meal	88.7	6.9	6.4	88.
Oats	90.8	9.7	8.7	67.
Oat meal	92.1	12.8	11.5	86.
Rye	90.6	9.9	9.0	93.
Wheat, all analyses	89.8	9.2	8.1	91.
Wheat, winter	89.1	8.7	7.7	91.
Wheat, spring	89.9	9.2	8.1	91.
Leguminous seeds:				
Bean, navy	86.6	18.8	16.4	73.
Cowpea	88.4	19.4	16.9	79.
Pea, field	90.8	19.0	16.6	78.
Pea meal	89.1	19.8	17.2	77.
Peanut with hull	93.5	19.4	16.9	85.
Peanut kernel	94.0	24.1	22.2	100.
Soybean	90.1	30.7	27.3	81.
Oil seeds:				
Cotton seed	90.6	13.3	11.9	78.
Flax seed	90.8	20.6	19.2	85.
Sunflower seed	95.5	23.3	20.2	95.
Sunflower seed with hulls	93.1	13.5	11.7	92.

	Dry matter	Digestible Crude protein	Digestible True protein	Net energy value
	Lbs.	Lbs.	Lbs.	Therms
DAIRY-PRODUCTS:				
ttermilk	9.4	3.4	3.4	13.32
w's milk	13.6	3.3	3.3	29.01
im milk—centrifugal	9.9	3.6	3.6	14.31
im milk—gravity	9.6	3.1	3.1	15.43
m milk—dried	91.7	34.4	34.4	103.91
hey	6.6	0.8	0.8	10.39
BY-PRODUCTS:				
Fermentation industries:				
ewers' grains, dried	92.5	21.5	20.2	53.38
ewers' grains, dried, below 25 % protein	91.8	18.7	17.5	50.93
ewers' grains, wet	24.1	4.6	4.4	14.53
stillers' grains, dried, from corn	93.4	22.4	18.3	85.08
stillers' grains, dried, from rye	92.8	13.6	11.1	56.01
stillers' grains, wet	22.6	3.3	2.8	22.05
lt	94.2	15.8	11.8	87.82
lt sprouts	92.4	20.3	12.5	72.72
Milling:				
ckwheat bran	88.8	10.5	9.1	30.59
ckwheat hulls	89.7	0.4	?	7.69
ckwheat middlings	88.0	24.0	20.8	72.19
miny feed	89.9	7.0	6.5	81.31
: bran	86.6	12.2	10.5	79.35
eat bran	89.9	12.5	10.8	53.00
eat middlings, flour	89.3	15.7	14.0	75.02
eat middlings, standard	89.6	13.4	12.0	59.10
Oil extraction:				
anut meal, low in fat	90.4	18.8	18.3	83.49
anut meal, high in fat	92.3	18.4	18.0	100.31
tonseed hulls	90.3	0.3	?	9.92
tonseed meal, choice	92.5	37.0	35.4	93.46
tonseed meal, prime	92.2	33.4	32.0	90.00
m oil meal, corn	91.1	16.5	14.3	83.88
seed meal, new process	90.4	31.7	30.9	85.12
seed meal, old process	90.9	30.2	28.5	88.91
nnut cake	89.6	12.4	12.0	94.18
ut cake from hulled nuts	89.3	42.8	41.4	93.55
ut cake, hulls included	94.4	20.2	19.5	42.57
ean meal, fat extracted	88.2	38.1	37.3	99.65
flower seed cake	90.0	32.0	29.1	88.87

	Dry matter	Digestible Crude protein	Digestible True protein	Net energy value
	lbs.	lbs.	lbs.	Therms
Starch manufacture:				
Gluten feed	91.3	21.6	20.1	80.72
Gluten meal	90.9	30.2	28.1	84.15
Starch feed, dry	90.7	12.2	9.2	77.40
Starch feed, wet	33.4	4.1	3.7	30.45
Sugar manufacture:				
Molasses, beet	74.7	1.1	0.0	57.[illegible]
Molasses, cane or black strap	74.2	1.0	0.0	55.[illegible]
Molasses beet pulp	92.4	5.9	3.5	76.[illegible]
Sugar beet pulp, dried	91.8	4.6	0.7	75.[illegible]
Sugar beet pulp, ensiled	10.0	0.8	0.5	9.[illegible]
Sugar beet, wet	9.3	0.5	0.5	8.[illegible]
Packing house:				
Dried blood	90.3	60.1	68.6	68.1
Tankage				
Over 60 % protein	92.0	58.7	55.6	9[illegible]
55–60 % protein	92.5	54.0	51.1	8[illegible]
45–55 % protein	92.5	48.1	45.5	72.[illegible]
Below 45 % protein	93.5	37.6	35.6	54.1

259 – **Chemical Composition, Digestibility and Feeding Value of Vegetable Ivory Meal.** — BEALS, C. L. AND LINDSEY, J. B. (Massachusetts Agricultural Experiment Station) in *Journal of Agricultural Research*, Vol. VII, No. 7, pp. 301-312. Washington D. C. November 13, 1916.

Vegetable ivory, or the corozo nut is the seed of *Phytelephas macrocarpa* (1) a plant found in great quantities in Colombia and which also grows in Peru and North Ecuador. The nuts are largely imported by Great Britain and Germany, while the United States use about 10,000 tons annually, costing $ 1 500 000. In the process of manufacture, a considerable portion of the nut is wasted in the form of sawdust, chips and turnings. In some countries this residuum has been mixed with other ingredients to be used as cattle fond. German writers state that vegetable ivory meal has been employed to the extent of 50 per cent as an adulterant

(1) *Phytelephas macrocarpa* R. and P., a *Pandanaceae*. This plant must not be confused with *Coelococcus carolinensis*? a Polynesian palm which, together with other plants supplies a similar product, also called vegetable ivory. Cf. WEHMER, *Pflanzenstoffe* 1911 p. 74.

in the manufacture of so-called concentrated feeds (1). In the last few years, many attempts have been made in the United States to discover a practical use for this waste material (2).

The writers have made many chemical investigations of vegetable ivory and have tried to determine the mannose present, for the corozo nut has been regarded as a source of this sugar.

From the results of this work have been obtained the data given in Table I which gives the writers' fodder analyses of vegetable ivory, together with the German analyses for purposes of comparison.

TABLE I. — *Fodder Analyses of Vegetable Ivory.*

Constituent	Max.	Min.	Average of 9 samples	German analyses (for comparison)
Moisture	12.64 %	6.13 %	11.39 %	18.30 — 13.20 %
Ash	2.30	0.80	1.08	1.30 — 1.10
Protein	5.56	3.94	4.63	4.60 — 4.00
Fat	1.18	0.60	0.92	1.10 — 0.80
Fibre	7.75	6.13	6.89	79.80 — 75.80
Nitrogen-free extract	77.56	74.17	75.09	

Vegetable ivory chiefly consists of carbohydrates, and especially of annan, the anhydrid condensation product of mannose which is present to the extent of 92.5 per cent. No lignin, starch, or dextrose, are to be found, but about 2.43 per cent of the dry matter consists of pentosans. An undetermined carbohydrate of the nature of pectin has also been observed. Water extracts of vegetable ivory meal gave about 0.5 per cent of reducing sugars, while the same solution after hydrolysis with hydrochloric acid, gave an average of 2 per cent of reducing material.

It was noticed that 5 hours' boiling was necessary to hydrolyse completely the mannose and other reducing materials, and the determination of the reducing sugars proves that the nitrogen-free extract is accounted for in the form of a hexose sugar, or its condensation product, except a small percentage of pentoses and pectin.

A number of bomb-calorimeter determination have been made to deter-

(1) Especially for adulterating palm oil cake. (A. EMMERLING Ueber Palmkernkuchen und-mehl, in *Die Futtermittel des Handels* published by the Verband Landwirtschaftlicher Versuchs-Stationen im Deutschen Reich, XVII, pp. 316-317, 1906. In Italy, corozo meal has of late been used in the adulteration of the olive residuum sold as cattle food. [*Ed.*].

(2) See also: FORMENTI, *Stazioni sperimentali agrarie*, XXXV, p. 229, 1902. [*Ed.*].

mine the average calorific value of vegetable-ivory, which proves to amount to 3.785 calories per gram, and is not very different from that of maize flour, sugar and maize starch. In button factories, however, where the ivory waste is used under the boilers as fuel, it has been stated that it produces about half as much heat as soft coal.

Two experiments, with 3 and 2 sheep respectively, were carried out to determine the digestibility of vegetable ivory meal. The animals ate it readily when it was fed with hay, maize gluten, salt and water *ad lib.* In a 3rd experiment it was found that the carbohydrates of the corozo nut are hydrolyzed and absorbed in the digestive tract of sheep. In the two first experiments were obtained the digestion coefficients of maize meal and vegetable ivory meal given in Table II.

TABLE II. — *Comparison of digestion coefficients obtained in Experiments I and II.*

Feed	Dry matter	Protein	Fat	Fibre	Nitrogen free extract
Vegetable ivory meal	84%	36%	51%	12%	92%
Maize meal	88	67	90	—	92

Applying these coefficients to the composition of the dry matter, we obtain the following amounts of digestible matter in 1 ton of each of the 2 feeds. (Table III).

TABLE III. — *Digestible nutrients (in pounds) in vegetable ivory meal and maize meal per ton.*

Feed	Protein	Fat	Fibre	Nitrogenous free extract	Total
Vegetable ivory meal . .	42.34 lb.	6.83 lb.	101.08 lb.	1,582.20 lb.	1,732.45 lb.
Maize meal	147.52	78.84	—	1,486.60	1,712.76

Feeding experiments made on cows showed that these animals ate vegetable-ivory meal, when mixed with other feed, without evidence of digestive disturbances. They refused to eat it if fed by itself.

When the vegetable-ivory meal (3 lb. per day) was fed in addition to a somewhat limited daily ration consisting of: 18.67 lb. hay – 2.34 lb. wheat bran – 2 lb. cottonseed meal and 1 lb. hominy, the experiment showed the favourable effect of the ivory meal. The addition of the latter increased the milk flow 5.7 per cent and its removal caused a decrease of 4.2 per cent. In a similar experiment, where the basal ration was somewhat below what the animals required for maintenance and normal milk production

the addition of the vegetable-ivory meal produced an increase of 3.46 per cent in the milk yield, which corresponds to 1 lb. of milk per 3.56 lb. of ivory meal.

Two other comparative experiments were also made, in the one was given an average daily ration of: 2.36 lb. wheat bran + 2.28 lb. cotton seed meal + 20.58 lb. hay, to which were added 3.36 lb. maize meal, or 3 lb vegetable-ivory meal: in the other experiment, the rations fed were: 2.38 lb. bran + 2.19 lb. cotton seed meal + 18.5 lb. hay to which were added, either 3.75 lb. ivory meal, or 4.01 maize meal. A summary of the results is given in Table IV.

TABLE IV. — *Five Weeks' Milk Production.*

Number of Cows	Ration	Milk Produced	Dry Matter	Fat
6	basal + 3.36 lb. maize meal.	5,243.5 lb	13.37%	4.56%
6	basal + 3.00 lb. vegetable-ivory meal* . . .	5,072.7	13.45	4.65
8	basal + 4.01 lb. maize meal.	6,931.3	13.50	4.87
8	basal + 3.75 lb. vegetable-ivory meal. . . .	6,403.3	13.47	4.93

* 2 cows were given in addition 1 lb maize meal.

Though the methods of feeding necessarily followed were not such that exact relative values could be shown, it seems certain that vegetable-ivory meal does not fully equal maize meal for milk production.

In the appendix there is a bibliographical list of 14 publications.

60 - **Comparative Results of Feeding Guinea-Pigs with Whole Grains of Barley in the "Quiescent" and in the Germinating State.** — WEILL, E. and MOURIQUAND, G., in *Comptes Rendus des Séances de la Société de Biologie*, Vol. LXXX, No. 1, pp. 33-35. Paris, January 6, 1917.

The writers have shown previously (1) that feeding of pigeons on an exclusive diet of whole raw grains of barley (or of any other undecorticated cereal) is capable of preserving complete nutritional equilibrium and does not induce nervous disorders of the beri-beri type such as are caused by the use of decorticated cereal grains. It is important to investigate what action a similar type of feeding may have on the nutrition of a mammal such as the guinea-pig of which barley grains in the dry state do not constitute the usual food.

Two guinea-pigs were put on a daily ration of 25 grams of completely raw barley, and two others on a ration of the same barley allowed to germinate at a suitable temperature for 3 days.

(1) See *B.* 1916, No. 415. (*Ed.*)

The comparison of the 2 sets of experiments show that a ration of whole barley when consumed in the "dry" state resulted in rapid denutrition of the guinea-pigs with fatal termination on the 29th. or 30th. day, whereas an equal ration of this same barley, consumed on the third day of germination, maintained nutrition at the normal level (or nearly so, with period of growth) for 106 days in one case (death on 114th. day) and for 69 days in another (death on the 74th. day).

Throughout the course of the experiment it seemed as if the grain in the "quiescent" state did not contain in suitable form the elements necessary for the nutrition of the guinea-pigs, and as if germination had developed in the grain a substance (or group of substances) capable of supporting nutrition at the normal level for a long period.

261 – **Improvement in the Method of Apportioning the Mangel Ration.** — *Feuille d'Informations du Ministère du Commerce, de l'Industrie, du Travail, des Postes et des Télégraphes, France.* Year XXII, No. 2, p. 10. Paris, January 9, 1917.

The whole of the nutritive principles contained in mangels at the moment of harvest undergo losses and modifications, sometimes to a considerable extent, during storage.

The sugars, particularly, gradually disappear. After 3 months storage in the silo 6 to 8 % of the sugar has vanished, in spite of the weight of the root remaining the same. After 4 months, the loss reaches 15 % and after 6 months, 25 %.

The nitrogenous matters, the total weight of which remains the same, undergo an unfavourable trasformation from the nutritive point of view. The total dry matter even is 10 to 12 % lower than at the time of harvest.

If the animals are to receive constantly the same quantity of nutritive elements it is therefore necessary to increase in a progressive manner the daily weight of mangels administered.

Though it is difficult to give precise indications as to the scale of increase (the nutritive value of mangels varying as much as 100 % according to variety and conditions) it may be said that after 2 months' storage the quantity figuring in the daily ration should be increased by 10 % in order to give the same food value.

After 4 months' storage, the increase should be 15 to 18 %, and after 6 months, about another 15 %.

262 – **Feeding Tests for the Toxic Effect of the Seeds of *Adonis aestivalis* contained in Milling Residues in Hungary.** — See No. 279 of this *Bulletin*.

263 — **Data on the Measurement of Inbreeding.** — PEARL, RAYMOND, in *Thirty-First Annual Report of the Maine Agricultural Experiment Station, Bulletin* 243, pp. 225-248. 5 Fig. Orono, Maine, 1916.

The pedigree of an individual consists of two halves. One of these

halves is made up of the sire and his ancestors; the other of the dam and her ancestors.

The coefficients of inbreeding for a particular pedigree are composed of the following elements:

1) The repeated occurrence of the same individual animals (types) on the sire's side of the pedigree only.

2) The repeated occurence of the same individual animals on the dam's side of the pedigree only.

3) The re-appearance of animals which appear first on one side of the pedigree (either the sire's or the dam's) then on the other side.

If only 1 and 2 are to be found in the pedigree, it means that the sire and the dam are totally unrelated (within the limits covered by the pedigree in the particular case). On the other hand, the re-occurrence of 3 means that the sire and dam are in some degree related and that a portion of the observed inbreeding arises from that fact.

The coefficients of inbreeding are calculated from the following formula,

$$Z_n = 100\,\frac{(p_{n+1} - q_{n+1})}{p_{n+1}}$$

where p_{n+1} denotes the maximum possible number of different individuals involved in the matings of the $n+1$ generation and q_{n+1} the actual number of different individuals involved in these matings. Thus Z_n (or more simply Z) is the coefficient of inbreeding and its value is from 0 to 100. If this formula is used for continued mating of brothers and sisters in a succeeding series of generations: $Z_0 - Z_1 - Z_2 - Z_3$, for Z we have $p = 2$ and $q = 2$: consequently $Z_0 = \frac{100\,(0)}{2} = 0$, and in a similar manner, $Z_1 = \frac{100\,(4-2)}{4} = 50$; $Z_2 = \frac{100\,(8-2)}{8} = 75$; $Z_3 = \frac{100\,(16-2)}{16} = 87.5$.

Now, the coefficients of inbreeding of themselves tell us nothing about what proportionate part has been played by the 3 elements in reaching the final result, nor do they reveal a possible relationship betwen the two members of the original pair.

The writer proposes a method for recognising and estimating these successive values. The ordinary pedigree is divided into 4 parts:

1) The first table includes the primary re-appearance on the sire's side of the pedigree of such animals as appear first on the same side.

2) The 2nd Table includes the primary re-appearance on the dam's side of such animals as first appear on the same side.

3) The 3rd Table includes the primary appearance on the dam's side of such animals as first appear on the sire's side.

4) The 4th Table includes the primary appearance on the sire's side of such animals as first appear on the dam's side.

The values of these last two Tables give the degree of relationship between the original couple.

King Melia Rioter is a pedigree Jersey bull (a type animal) which first appeared on the sire's side of the pedigree. In the 5th Table, where we find the primary re-appearances on the dam's side of the pedigree of animals which first appear on the sire's side we have:

Generations	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
King Melia Rioter.	1	(2)	(4)	—	—	—	—	—	—	—	—
St Lambert's Rioter King.	—	—	1	(10)	—	—	—	—	—	—	—
King of St Lambert	—	—	—	1	—	—	—	—	—	—	—
St Lambert Boy	—	—	—	1	(24)	—	—	—	—	—	—
St Lambert Boy	—	—	—	—	2	—	—	—	—	—	—
Oakland's Nora.	—	—	—	—	1	—	—	—	—	—	—
St Lambert's Rioter King.	—	—	—	—	1	(56)	—	—	—	—	—
St Lambert Boy	—	—	—	—	—	1	—	—	—	—	—
King of St Lambert	—	—	—	—	—	1	—	—	—	—	—
St Lambert's Letty	—	—	—	—	—	1	(118)	—	—	—	—
Letty Coles 2d.	—	—	—	—	—	—	1	(238)	—	—	—
King of St Lambert	—	—	—	—	—	—	—	1	—	—	—
Louise's Grace	—	—	—	—	—	—	—	1	—	—	
Totals	1	2	5	12	28	59	119	240	480	960	1 920

From this Table it is obvious that a very considerable portion of the inbreeding shown in the pedigree of King Melia Rioter arises from the fact that his sire and dam were closely related. The 4 Tables relating to King Melia Rioter can be summarised as follows:

Generations	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Male only (Table I)	—	—	1	3	16	41	105	210	447	898	1 796
Female only (Table II)	—	—	—	1	2	4	8	16	32	64	128
Cross-over (Tables III and IV)	1	2	5	12	28	59	119	240	480	960	1 920
Totals	1	2	6	16	46	104	232	475	959	1 922	3 844

If the coefficient of inbreeding is calculated only from the values given in Tables III and IV, another coefficient, the "coefficient of relationship" is obtained = K. This shows the influence of the relationship of the ancestral pair upon the marks of inbreeding observed in their descendants. The two coefficients, the inbreeding coefficient, Z, and the relationship

coefficient, K, are with some limitations independent of one another, as may be seen from the following Table:

Generations	Maximum Possible Value of Z when K = 0	Maximum Possible Value of Z when K = 100
A_1	0	0
A_2	0	50.00
A_3	50.00	75.00
A_4	75.00	87.50
A_5	87.50	93.75
A_6	93.75	96.88
A_7	96.88	98.44
A_8	98.44	99.22
A_9	99.22	99.61
A_{10}	99.61	99.80

Froom this it appears: 1) that Z and K are within certain limits independent: 2) that after 10 generations the coefficient (degree) of inbreeding is the same, whether the ancestral pair were related or not.

But it *quantitively* the result is the same, the germinal constitution of the individual produced, would, except by the most remote chance, be quite different in the two cases. The method suggested by the writer permits of this *qualitative* difference in the descendants being estimated.

264 - **The Herd and Stud Books of the Argentine Rural Society.** - *Anales de la Sociedad Rural Argentina*, Year 41, Vol. I., pp. 489-491. Buenos-Aires, September-October 1916.

The appended tables give the entries in the Herd and Stud Books of the above Society since its foundation, and also the entries for the

Argentine Herd Book.

Breeds	Entered between Oct. 1 1915 and Sept. 30, 1916				Entries since foundation		
	Imported		Bred in the Country		Imported and bred in the Country		
	Bulls	Cows	Bulls	Cows	Bulls	Cows	Total
Shorthorn	402	96	4 069	4 244	45 331	48 502	93 833
Hereford	13	—	554	556	8 613	10 794	19 407
Aberdeen Angus	32	11	583	558	4 009	4 325	8 334
Red Shorthorn	2	—	6	7	138	196	334
Red Polled	-	—	13	12	99	112	211
Devon	—	—	1	2	15	20	35
Jersey	2	5	10	9	35	43	78
Flemish	—	—	30	36	134	465	599
Totals	451	112	5 266	5 224	58 374	64 457	122 831

Argentine Stud Book.

Breeds	Entered between Oct. 1, 1915 and Sept. 30, 1916		Entries since foundation (1907)		
	Stallions	Mares	Stallions	Mares	Total
Percheron	298	358	3 323	5 492	7 818
Clydesdale	145	221	1 842	4 695	6 537
Hackney	185	180	1 802	2 685	4 487
Shire	124	164	1 699	3 199	4 808
Yorkshire	26	52	262	705	967
Suffolk-Punch	13	40	180	519	699
Boulonnais	18	25	144	195	396
Anglo-Norman	7	30	182	651	833
Hunter	10	21	50	151	201
Polo-Pony	5	11	64	80	144
Orloff	6	9	87	110	197
American Trotting	2	7	5	23	28
Belgian	2	4	21	70	91
Shetland-Pony	1	2	10	24	34
Oldenbourger	1	2	10	15	25
Holstein	1	—	10	11	21
Trakehnen	—	—	2	—	2
Totals	844	1 126	8 603	18 625	27 228

Argentine Flock Book.

Breeds	Entries from Oct. 1, 1915 to Sept. 30, 1916						Number of breeding animals entered finally and in trial at the same period			
	Imported		Bred in the Country		Preparatory Register		Final		Preparatory	
	Rams	Ewes	Rams	Ewes	Inspection	Presentation	Rams	Ewes	Rams	Ewes
Lincoln	289	—	1 691	1 862	—	2 282	2 237	8 935	7 502	18 642
Merino Argentine	—	—	596	555	—	—	1 007	2 377	—	3 384
Shropshire Down	3	—	42	50	—	27	57	203	222	482
Oxford Down	7	—	48	60	25	66	55	219	219	403
Romney Marsh	13	—	20	20	—	200	49	86	1 128	1 263
Hampshire Down	36	—	67	41	—	128	121	617	584	1 322
Border Leicester	1	—	7	9	—	—	9	126	—	135
Corriedale	—	—	—	—	—	—	1	—	50	51
Totals	149	—	2 471	2 547	25	2 703	3 536	12 581	9 705	25 822

Argentine Swine Book.

Breeds	Entries between Oct. 1, 1915 and Sept. 30, 1916			Entries since foundation		
	Boars	Sows	Total	Boars	Sows	Totals
Berkshire	958	1 421	2 379	4 220	5 285	9 505
Middle White Yorkshire	123	171	294	1 388	1 889	3 277
Large Black	85	80	165	1 167	1 278	2 445
Poland China	23	43	66	109	136	245
Tamworth	50	64	104	85	142	227
Large White	—	—	—	43	67	110
Duroc Jersey	11	11	22	36	41	77
Lincolnshire	—	—	—	—	1	—
Totals	1 240	1 790	3 030	7 048	8 839	15 887

last year October 1, 1915 to September 30, 1916. They include all the pure-bred cattle, horses, sheep and pigs produced or imported into Argentina and show the yearly condition of the industry for breeding pure-bred animals in Argentina.

From these figures and those of the preceding year (1) the increase in numbers of the different pure-bred categories is seen to be as follows:

	Increase from October 1, 1915 to September, 30, 1916
Cattle	11,253
Horses	1,970
Sheep	17,626
Pigs	3,030

These increases are particularly due to cattle of the Shorthorn (8,811 head), Hereford (1,123 head) and Aberdeen Angus (1,184 head) breeds: to horses of the Percheron (656 head), Clydesdale (366 head), Hackney (365 head) and Shire (288 head) breeds; to Lincoln Sheep (18,692 head), Argentine Merinos (3,384), Oxford Down (1,263), Romney Marsh (1,322); to Berkshire pigs (2,379 head) and Middle White Yorkshire with 294 head. The four predominating pure breeds are Shorthorns among cows, Percherons among horses, Lincolns among sheep, and Berkshires among pigs.

(1) See *B.* 1916, No. 202. (*Ed.*)

265 - **Economics of the Breeding of Pure-Bred Stock.** — WENTWORTH, E. N., *The Field*. Vol. XXVI, No. 12, pp. 1009-1011. New York, December 1916.

Pure-bred stock represents the accumulated effort of generations of breeders leading to a well defined end, which may be expressed in profits already realised or in profits to be realised in the future. The price of pure-bred stock exceeds that of normal stock in view of the productive or reproductive capacity peculiar to each individual in relation to that of normal common individuals. This excess of value depends in its turn on various factors each of which represents the relative commercial value of a character exceeding those of the ordinary type on the market.

Careful observation of the markets shows that this increase is, roughly speaking, 15 to 20 % for reproductive power and more than 50 % for purity of blood combined with reproductive power.

The facts contained in the appended table, which refer to the maize-zone of the United States, whilst representing approximate averages, show this phenomenon much more clearly than could the valuation of profits on pure-bred stock which have either been already realised or remain to be realised in the future.

	Pigs (about 133 kg.)	Beef Animals	Sheep	Agricultural Mares	Dairy Cows
	—	—	—	—	—
Normal average market value	$ 27	$ 90	$ 7.50	$ 225	$ 150
Reproductive value	$ 32	$ 110	$ 9.00	$ 260	$ 150
Value of purety of blood	$ 45	$ 150	$ 12.50	$ 400	$ 250

These relative prices naturally refer to animals of similar type and conformation. Reproductive power in dairy cows does not increase the normal average market value because this is based on milk production which is an inverse quality to reproductive power.

Reproductive power increases the value of an animal because it gives a higher profit on the market than does normal production.

The value of pure-bred animals, on the contrary, is based more on future than present profits. Given two reproducers of equal individual merit, the pure-bred reproducer has a much higher value because, as a rule, it represents a better guarantee for good progeny. Reproductive capacity includes two factors: 1) the power of transmitting good characteristics to the descendants with greater uniformity; 2) a less strong tendency to the appearance of negative characteristics in the descendants. Both these advantages are the result of selection based on the ascendants to eliminate negative qualities and to unify and improve positive qualities.

There are many possible methods of obtaining these results, but none of them have a positive value because the relative success gained depends

on the way in which the breeder makes use of them. They have the practical character of a weekly test of the control of milk production. Anyone attempting to deduct from this the exact production of the productive cycle of the cow would find many contradictions in its application.

If it is used for comparison between two or more individuals, better results may be obtained. Finally, when used to study the special qualities of an individual which cannot develop under normal conditions, the weekly test at high tension, so to speak, is a method which allows a fundamental study to be made of the latent or reserve energies of the individual in relation to its productive power, its capacity of transforming food-stuffs and its nervous organisation.

In the same way the application of indications of predominant character, of pedigree, of fancy points or of family lines, as measures of the capacity to transmit characteristics should only be taken into consideration in so far as these various elements are correctly interpreted. If they are used as relative and not as absolute measures, they express in part the degree of uniformity and of constancy to which the pure-bred animal is capable of transmitting its characteristics, but they are practical methods capable of giving results only when used by experienced breeders who can estimate the value of failure as well as that of success.

Thus the predominant character in hereditary transmission does not go beyond the specific characteristics peculiar to the masculine or feminine appearance.

The fancy points only constitute the trade mark of the race, and hereditary power is usually quite independent of caracteristics of value. It cannot, therefore, be said that, because it transmits certain more or less insignificant traits characteristic of the race, it has any special degree of dominance.

Biologically, the progeny represent data of greater value although, from a practical point of view, there are also considerable differences in this respect.

To the intelligent breeder the pedigree is the most important consideration to be kept in mind. If there are animals whose excellence has been proved most closely related to the genealogical tree, and if they occur in both branches of the genealogy at the same time, the breeder may feel a certain sense of security with regard the the power of transmitting superior characteristics. The greater the number of descendants whose worth has been proved, the greater is the certainty with regard to dominance. With regard to valuable animals, the length of the pedigree is looked upon by breeders as an indication of marked powers of reproduction and selection. The length of the pedigree is an equally valuable criterion in the descendant and it is here that a pure-bred animal is superior to a grade animal. Each breeder could have actual data with regard to the the power of

transmitting characters possessed by any given dam, but other breeders could have no knowledge of these qualities and, a few years later, all traces of its individual merits will have disappeared. The individual merits of an pedigree animal are actual data which pass into the annals of the race to which it belongs, data which are taken into account in the valuation of each lineal descendant, which represents a hereditary fraction of these merits. Admitting that the merits of the immediate ascendants of an animal of common stock improved by a pure-grade are known, and that a pure-grade animal has immediate ascendants of equal value, this latter will have over the improved animal the advantage of progenitors having a well-defined identity which will allow the collected efforts of many breeders to be utilised. The relative value of the pedigree and of individual merit is a problem which deserves special attention. In this respect it must be remembered that a pure-bred animal may become a scrub under the influence of two forces, each with a separate action; it may appear to be a failure because the good qualities have disappeared or have been lost in the hereditary transmission, or, more often, it may appear to be a failure because of insufficient development. If it is certain that this inferior animal belongs to the second class it should always be used for reproduction in preference to an animal chosen by crossing, even if this latter has certain superior individual qualities. If it belongs to the first class there is no liklihood that, for the breeder, it has a superior value to the other. In consideration of the difficulty of determining the reason for the inferiority of a pure-bred animal, it is, in practice, usually wise to refrain from excessive optimism.

Breeders of pure-breds are also often faced with the problem of selecting from individuals of high lineal descent but of secondary merit, and from those of less celebrated family or descent, but with marked individual merit. In such cases the choice must be subordinated to the aims of the breeder. If he wishes to sell his products to breeders or producers of improved animals he should choose animals of individual merit. If he wishes to develop his dairy herd for exhibition or competition purposes he should still give preference to individual merit. If, on the other hand, he wishes to become a professional breeder of pure-bred stock, according to more distant, or even more difficult, schemes, he cannot ignore celebrated pure-breds, especially if he intends to sell his products to breeders working for the same end. In this case, whilst considering individual merits, even the best individuals will be sold at a lower price than animals belonging to celebrated families of pure-breds.

The profits from the breeding of pure-bred stock are closely connected with the fact that it is a sort of nursery in which the original seed reproduces itself with an identical aim. It can, therefore, not be compared with ordinary breeding.

The breeding of pure-bred stock in the United States only includes from 2 to 4 % of the total of the various zootechnical categories; by reason of its nature it must progress slowly. This is due to the fact that this branch of animal production is relatively new, and that, in the past, it was limited to breeders and agriculturists to whom the cost of pure-bred reproducers was a matter of secondary importance.

Since pure-bred stock are considered, so to speak, only as breeding animals, they command a price on the market which is unknown to ordinary or improved stock. It is in these prices that lie the market profits, which, when finally analysed, represent the capacity of transmitting economical characteristics to the progeny. This capacity cannot be recognised, however thoroughly it may be studied, even after 2 or 3 years of reproductive tests. The breeder of pure-breds who studies the indication which he believes to be connected with hereditary power and who acts on these indications is assured of profits which cannot be realised in ordinary animal-production for general market purposes.

266 - **A Cattle Reserve in Nigeria.** — CANNING, A. R., in *United Empire, The Royal Colonial Institute Journal*, Vol. VIII (New Series) No. 1, pp. 40-41, London, January 1917.

The writer states that immense cattle reserves, 5 million head, exist in Nigeria. The animals could doubtless be easily purchased in the Bornu provinces, whence they could be driven down to Kano and transported by rail to Lagos. From Lagos, the frozen carcasses might be shipped for Europe. The quality of the beef is said to be, in some cases, quite equal to the British product. The writer advises that the herds of cattle for slaughter should be collected at a fixed date, that the animals should be examined by veterinary surgeons in Bornu, and rested and fattened in a reserve area near the railway, and that a large refrigerator should be put up at Lagos. A small refrigerator capable of handling some 24 carcasses already exists there. The utilisation of this enormous reserve of cattle would be greatly facilitated if the work were carried out under Government control.

267 - **Studies made by the Imperial Sericultural Station of Japan.** — *The Bulletin of the Imperial Sericultural Experiment Station Japan*, Vol. I, No. 1, 149 pp. + 2 Coloured Plates. Tokio, May 1916.

The bulletin analysed contains the following articles:

1. ETSUO KATAYAMA, Researches into the Nitrogenous Compounds in Mulberry leaves.

2. ROKUSABURO KUDO, Contributions to the Study of Parasitic Protozoa: I On the Structure and Life History of *Nosema bombycis* Nägeli.

3. KAORU AOKI, Precipitation Experiments with the Immune-serum of Silkworms.

4. KAORU AOKI, and YOSHIKA CHIGASAKI, On the Possibility of Applying the Agglutination Reaction in the Bacteriological Examination of Silk-worms. For the further Elucidation of the Question of the Identity of *Bacillus sotto* (Ishiwata), *B. alvei* (Cheshire and Cheyne) and B. *megatherium*.

5. KAORU AOKI and YOSHIKA CHIGASAKI, On the Virulence of the So-Called *Bacilli sotto* (Ishiwata) in Silk-worms.

6. KAORU AOKI and YOSHIKA CHIGASAKI, On the *Bacillus sotto* which des not produce Toxic Substances.

Mr. E. KATAYAMA has established the presence of the following substances in mulberry leaves.

Nitrogenous Compounds	Amount of substances obtained from 1 kg of leaves dried in sun still containing 12.32 per cent of residual water)		Amount of substances obtained from 100 gr. of albuminoids
	in free state	obtained by complete hydrolysis	
Glycocoll	0.06 g	1.50 g	0.90 g
Alanine	1.00	19.00	11.00
Valine	0.47	10.50	5.60
Leucine	0.60	21.00	8.00
Proline	0.65	2.50	1.40
Serine	—	2.00	0.80
Asparaginic acid	5.20	6.00	2.40
Phenylalanine	0.60	2.50	2.30
Tyrosine	present	—	0.90
Guanine	0.10	—	—
Adenine	0.52	—	—
Hyperoxanthin	0.12	—	—
Histidine	0.20	1.30	0.96
Arginine	1.30	8.80	1.20
Lysine	0.93	6.60	1.70
Choline	1.93	2.50	—
Trigonelline	0.20	—	—

In the 3rd. of the studies mentioned above, Mr. K. AOKI has applied the method of precipitation with immune-serum to the study of the degree of relationship between the silk-worm (*Bombyx mori*) and the kindred species, *B. Mandarina*, *Antheraea Pernyi*, *A. Yamamai*, *Caligula japonica*, *Dendrolimus Pini*, *Lymantria dispar*, *Diacrisia anino* and *Papilio xuthus*. He further studies the manner in which the precipitate varies with the different stages in the development of *Bombyx mori*, from the egg to the moth and investigated the precipitation reaction in the silk glands and other organs. From the total results obtained, he drew the following conclusions amongst others.

1. By means of the reciprocal precipitation of different species (

animals, the degree of their affinity can be accurately determined, and therefore their position in the zoological scale.

2. The amount of an immune-serum precipitate is not always equal when the serum of the same species of animal is used, if the serum comes from larvae in their 2nd, 3rd, or 4th, stage of deveopment. In these cases, the precipitate is much less than that obtained from the serum of adult individuals or from the liquid expressed from the eggs. The latter substance gives the heaviest precipitate.

3) An undoubted specific organic reaction has been found in the silk glands of *B. Mori*.

4) No difference was observed in the precipitate of the serums of the two sexes in the presence of the two kinds of sexual glands belonging to *B. Mori*.

In the 4th article, Messrs. K. Aoki and Y. Chigasaki show that:

1. The agglutination reaction in the case of the *sotto bacillus* is strictly specific.

2. By means of this immune-reaction, *Bacillus sotto* (Ishiwata) can easily be distinguished from *B. megatherium* and *B. alvei*, thus the question of their identity has been solved in the negative.

In the 5th article, the same writers show that when the silkworms were fed on a young culture of *sotto* bacilli, the microorganism perished and the larvae were not killed, when however, the silkworms were given an old culture of the same bacilli, they were killed in 3 hours. In fatal cases, the microorganisms do not multiply in the intestinal canal, but only in the haemo-lymphatic system, where they cause septicemia and sapremia. The toxic substance is present in the bacterial colonies whence it can be partially removed, by shaking it in a solution of sodium chloride; it does not pass through a Chamberlain filter.

Different disinfectants act in different ways on *Bacilli sotto* and the toxic substance they produce.

In the 6th. paper, the same writers describe a race of *sotto* bacilli discovered by themselves, which is not able to produce fatal effects if it is cultivated in agar, though it retains its property of causing septicemia. This atoxigenous race cannot be distinguished from the normal toxigenous races, either by cultural means, or by the use of immune-serums.

FARM ENGINEERING.

§ - **Exhibition and Trial of New Agricultural Machinery and Appliances organised by the German Agricultural Society in 1916.** – FISCHER, G., in *Mitteilungen der Deutschen Landwirtschafts-Gesellschafts*. Vol. 45, pp. 730-733. Berlin, November 4, 1916.

In 1916, on the occasion of the " Landwirtschaftliche Woche " (agricultural week) the German agricultural society organised an exhibition

and trial of new agricultural machines and implements (excluding dairy machinery, etc.), in order to give the manufacturers a chance of submitting improvements to the Society in spite of the present crisis and to introduce them to the agricultural public.

There were 64 machines and types of apparatus entered, and the exhibition was well patronised. Of these machines, etc., 5 (*i. e.* 7.8 % of the entries) were judged as " new and worthy of attention (" neu und beachtenswert "), 42 (65.6 %) were reserved for trials, and 16 (25 %) were not considered worthy of mention. In comparison with the exhibitions of previous years, there were less entries, but there were more trials.

The following machines were considered to be " new and worthy of attention ".

1) *Portable membrane pump* K 14 by the BERLINER PUMPENFABRIK, AKTIENGESELLSCHAFT VORMALS MAX BRANDENBURG, Berlin. S. O. — Between the upper and open end of the pump and its lower, closed end is a plate-shaped membrane of stretched leather, which is alternately pushed up and down by means of a bent lever and a connecting rod controlled by the pump-handle. To the left is the suction pipe and on the right is the valved supply pipe. The pump is mounted on a wooden base, provided with hollows for carring; the operator stands on the wooden base while pumping to increase the stability. The pump delivers nearly 1000 gallons per hour to a small height, weighs 57 lbs and costs 100 *marks* (about £ 5) including flexible suction and supply tubes.

2) " *Hannibal Ante portas Pump* ", *1915 model*, by P. C. WINTERHOFF of Düsseldorf. — This pump, already described in previous reports of the German Agricultural Society, has been improved by adding new valve-seatings under German patent No. 270 152. On the rubber ring used as a seating a bar presses carrying a pointed spur that prevents the ring being moved by pressure from below upwards. These valve seatings have been placed in both suction and delivery pipes. The pump, mounted on a wood base and thus easy to remove, weighs about 88 lbs; obtaining water at 23 feet and delivering it at 33 feet, it delivers 2200 galls. per minute. The price of 150 *marks* (£ 7–10–0) includes flexible tubes for suction and delivery.

3) *Mower with a foot-lever for raising the knife-bar*, by the " MASCHINENFABRIK FAHR, A. G. ", at Gottmadigen, Baden. — By first depressing a lever with the right foot, when the machine is either stationary or working, the driver can lift the knife-bar into a vertical position without using his hand; by depressing the lever *once*, the knife-bar can be lifted to the usual height, *i.e.* above small obstacles; in this position the bar is held by a catch, and when the lever is depressed the second time the bar is brought into a vertical position. By means of catches holding it

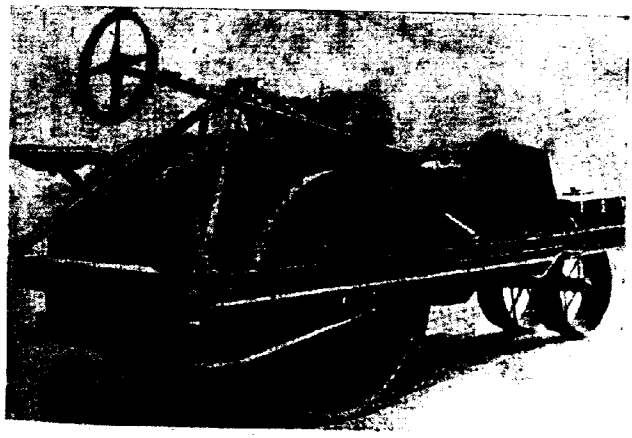
in position with regard to the 2-armed lifting-lever the foot-lever is equally available at the second depression as at the first. To lower the knife-bar, another foot-lever is used. Such a machine works on a breadth of 4 ft. 6 ins., weighs 748 lbs and costs 345 *marks* (£ 17-5-0).

4) *The "Wilhelma" grinding and crushing mill*, by the "FULDAER MASCHINEN- UND WERKZEUGFABRIK WILHELM HARTMANN", of Fulda, Hesse-Nassau. — Mill with artificial, vertical stones, 72 ft 6 ins in diameter, mounted on a horizontal axis with 3 bearings. The mechanism for regulating the fineness of milling is close by the outlet, within reach of the operator. The shaking mechanism has a good control system which prevents useless work. The mill requires a driving force of 8 to 12 H. P. and produces 1760 to 5280 lbs per hour; it cost 950 *marks* (£ 47-10-0).

5) "*Rheinland*" *cylinder mill*, by the "MASCHINENFABRIK W. LEY", of Wülfrath, Rhenish Prussia. — The characteristic of this mill is that the gear between the cylinders is freed by pulling out a bolt, which easily allows the two cylinders to be given the same speed. The mill weighs 1100 lbs and grinds 1760 lbs of cereal per hour, using 5 to 7.5 HP: it costs 760 *marks* (£ 38).

269 - **Whiting Standard Agricultural Tractor.** — *The Implement and Machinery Review*, Vol. 42, No. 501, p. 1020, 1 fig. London, January 1, 1917.

Messrs. WHITING (1915), Ltd., 334-340, Euston Road, London, N. W. are placing the Whiting Standard Tractor upon the English market. This



Whiting Standard Agricultural Tractor.

is of 24 h. p., and has a four-cylinder 3 3/4 in. by 5 in. engine which runs on petrol. The transmission is by chain which runs between the two drive wheels in the rear, each being 45 in. in diameter and 24 in. wide. The total length of the tractor is 14 ft. 6 in. and its width 6 ft. 2 in.

All the working parts of the engine are enclosed so as to be free from dust; only one hand lever is used in ordinary work; and there is no differential, the drive on the wheels being direct and positive. It is claimed that this tractor will turn in a 30 ft. circle, and that it will turn as easily and smoothly on freshly ploughed land as on dry soil.

Demonstrations of this tractor are now being arranged.

270 - **Trailer for Men who have lost a Leg.** — MAURIN, G., in *Journal d'Agriculture pratique*, Year 80, No. 26, pp. 455-456 + 1 Fig, Paris, December 28, 1916.

Dr. ALBERT MARTIN of Rouen (France) invented this trailer, only weighing from 88 to 100 lbs, in order to enable men having lost a leg to work with a double plough without tiring themselves too much.

The apparatus, which consists of a wheel chair for the disabled man, is attached behind the plough and at the end of each furrow the man

Dr MARTIN's trailer.

gets out of the chair, detaches it from the plough, then turns and places the double plough in position; then he again attaches the drag on which he sits until the other end of the furrow is reached.

The drag is made of wood and is built symmetrically so as permit its use in either direction. In the middle, under the seat, the drag is supported by a large furrow wheel and by a small land wheel, which latter can be adjusted in respect to the large wheel and according to the furrow-depth. For this purpose the axle of the small wheel carries an upright pierced with holes; a bolt holds the wheel in the desired position.

271 - **Improved Apparatus for Determining the Test Weight of Grain, with a Standard Method of Making the Test.** — BOERNER, E. G. in *U. S. Department of Agriculture, Bulletin* No. 472, 15 pp., 8 figs. Washington, D. C., October 30, 1916.

The improved testing apparatus for obtaining the weight per bushel described in this bulletin was designed to reduce to a minimum the personal error in making the test and to standardize the method of determining the test weight of grain.

DESCRIPTION OF THE DEVICE. — The apparatus (fig. 1) is in two main parts: 1) The stand, with hopper and overflow pan, and 2) test kettle, with a special beam. The base of the stand is made up of two layers of wood held together with screws. Each layer is 1 1/4 inches thick, the upper layer projecting 1/4 inch over the lower layer around the edges, so that the base can be conveniently fastened into a table top if desired. In the forward part of the base is contained a circular opening with bevelled edges, of the shape and size shown in figure 2. A grate made of four metal bars fastened into the lower layer of the base extends across the opening in the base, as shown in figure 3. A circular metal disk, or plate, upon which the test kettle rests when in place, is clamped on the upper side of the grating in such a position that the centre of the plate coincides with the centre of the opening in the base. Two metal guide pins, about 3 inches apart, are fastened to the edge of the plate and then extended upward about half an inch higher than the surface of the plate. These guide pins are placed here to centre the quart test kettle when it is in place on the plate. The two guide pins are connected by a strip of metal of the size and shape illustrated in figures 2 and 3. This strip of metal is free-swinging, and when swung over on the plate forms a guide for centreing the pint test kettle.

Fitted into metal sockets sunk into the after part of the base are two tubular metal posts 19 inches long and connected with a casting at their upper ends. Fitted to the forward or main post are two free-swinging metal brackets or arms, the lower one of which terminates in a ring 7 1/4 inches in diameter to hold the hopper, the upper arm terminating in a hook from which the scalebeam can be suspended. The arms are held in place at any given height on the post by means of two metal clamps, as shown in figure 2.

Each of these arms has a projection extending backward past the rear or guide post, so arranged that when the ring of the lower arm and the hook of the upper arm are swung to a position directly over the plate in the base these projections are in contact with the guide post. The projection on the lower arm allows the arm with funnel to swing to the left, while the projection on the upper arm allows this arm with its scalebeam to swing to the right.

The base of the stand rests on three adjustable metal legs which fit into metal sockets sunk into the under side of the base, in the positions

Apparatus for Determining the Test Weight of Grain

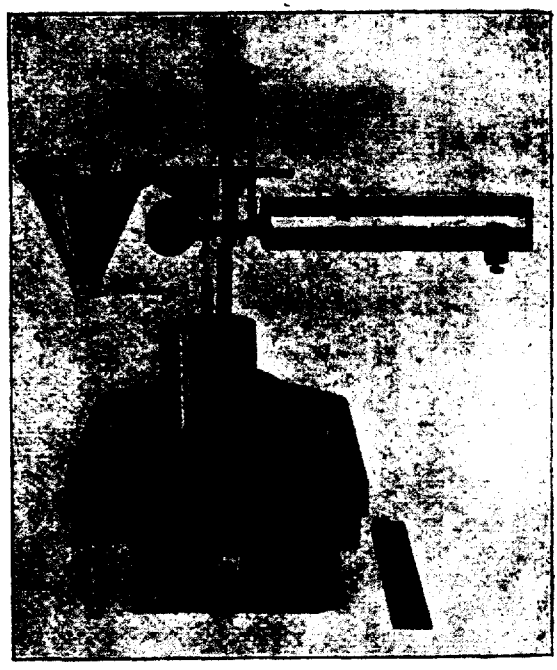


Fig. 1. Front view of apparatus.

shown in figure 3. The legs are held in place by means of set screws. A pan for catching the overflow from the test kettle is placed underneath the grating.

Apparatus for Determining the Test Weight of Grain.

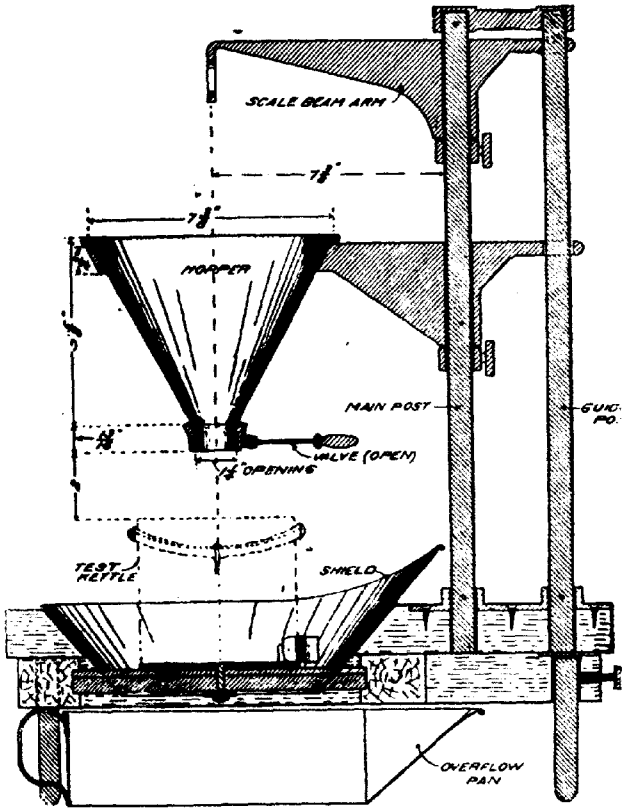


Fig. 2. — Vertical section.

Apparatus for Determining the Test Weight of Grain.

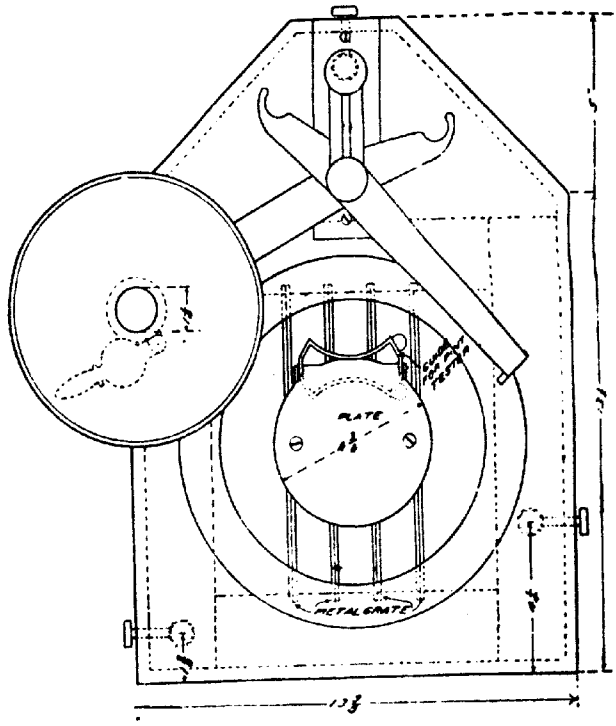


Fig. 3. — Schematic horizontal projection of the apparatus showing arrangement of grate, disk and guide.

The hopper, which rests in the ring of the lower arm, is large enough to hold more than a quart of grain and should be of the shape and size shown in figure 2. A valve at its lower opening holds the grain in the hopper until ready, to make the test. The opening, or outlet, in the bottom of the hopper is 1 1/4 inches in diameter.

The special stroker is of hard wood, 3/8 inch thick, 1 3/4 inches broad, and 12 inches long, each edge being a perfect half circle. This stroker should be used for all tests.

The stand can be used with either the ordinary test kettle and beam or with the test kettle and special combination beam.

The special beam, graduated to read in tenths of a pound, was devised in order to make it possible to obtain reliable results reading in fractions of a pound. This special beam has two bars, one above the other, each of which has three lines of graduations. The first line on the lower bar reads in pounds per bushel, in divisions of 10 pounds up to 60 pounds; the second line reads in pounds and ounces by one-half ounce division up to 2 pounds dead weight, and is used principally for determining "dockage" in grain; the third line reads in percentage of 2 pounds by 1 per cent divisions up to 100 per cent.

The first line of graduations on the upper bar reads in pounds and tenths of a pound up to 10 pounds per bushel, the second line reads in grams by 2 gram divisions up to 200 grams dead weight; and the third line reads in percentage of 200 grams by 1 per cent divisions up to 100 per cent. These last two lines of graduations will be found especially useful in the analysis of corn to determine what it should grade from the standpoint of damaged kernels or of foreign matter and finely broken corn.

The poise on the lower bar is supplied with a set screw, so that it can be moved to any one of the 10 pound graduations and clamped in position to keep it from shifting while repeated weighings are being made on the upper beam.

OPERATING THE TESTER. — Place the tester on a solid table top or other firm base. Adjust the height of the funnel arm so that the opening in the bottom of the funnel is exactly 2 inches above the top of the test kettle. Place the test kettle on the metal plate over the grate and see that the overflow pan is in place under the grate opening. Swing the hopper arm into forward position until the projection extending backward is in contact with the guidepost. Close the valve in the outlet from the hopper and fill the hopper with the grain or seed to be tested. Open the valve wide with a quick motion and allow the grain to run through until the kettle overflows. Swing the hopper arm out of the way to the left. Strike the excess grain from the top of the test kettle with three zigzag motions of the special stroker, being careful that the sides of the stroker

are held in a vertical position and that the kettle is not jarred during the operation. Bring the beam arm with beam suspended into its forward position. After hooking the test kettle to the short arm of the special scalebeam, the poise on the lower beam must be placed at one of the graduations showing a weight lower than the sample is expected to weigh and the operation is completed by moving the poise on the upper bar to a point necessary to make the beam balance.

If the ordinary beam is used instead of the special beam, then the weighing should be done in the usual manner, except that the beam should be suspended from the hook of the upper arm instead of being held by hand.

STANDARD METHOD OF MAKING THE TEST. — The conditions given in the method described below have been found to be most essential in making uniform tests of weight per bushel and obtaining accurate results and have been adopted by the U. S. Department of Agriculture, as standard in connection with Grain Standardization Investigations:

1) Have an accurate grain tester.

2) Fill the test kettle from a hopper:

a) having an opening 1 1/4 inches in diameter at its base.

b) firmly supported 2 inches above the test kettle.

3) Have the test kettle rest on a firm base.

4) Fill the kettle each time with the same amount of overflow.

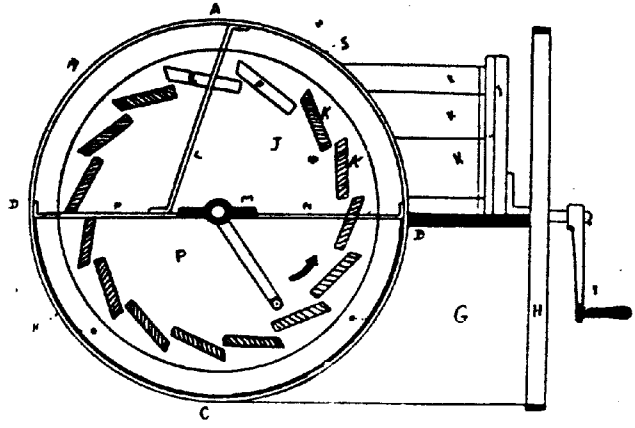
5) Strike the excess grain from the top of the overflowing kettle in a uniform manner with three zigzag motions with sides of the special stroker held vertically, avoiding meanwhile any jarring of the contents.

6) Make the weighings on a beam accurately graduated to read in fractions of a pound.

272 - **The "Cataract" Root Washer and Peeler.** - *The Implement and Machinery Review*, Vol. 42, No. 501, p. 1014, 1 fig. London, January 1, 1917.

A new machine for washing potatoes, carrots, beet, parsnips and all kinds of medicinal roots has been brought out by the British Fruit Evaporator Company, Ridsdale-rd., Anerley, London, S. E. This in shown in the accompanying diagram, which is an end section and a part longitudinal view of the machine. *A B C* and *D* show one of the two ends of the tank, forging a circular frame into which the tank *G* is built. Across the centre runs a bearing rail *N* carrying the bearing *M* and the barrel spindle. *L* is a strengthening rail and *P* is the end of the tank. *J* is the disc of one end of the barrel, of which *K K K* are three of the slats. *F* and *E* are the slats which open to enable the roots to be placed in and emptied from the barrel. The method of operation is as follows: The tank is sufficiently filled with water from a tap or other source, and the roots are placed in the barrel through the *E F* slat opening, which is then closed. The handle is rotated in the direction of the arrow, and when the roots are cleaned

the whole tank is rolled a quarter turn, by which movement point *B* is brought lowermost and the water is immediately emptied from the tank. A further quarter turn empties the tank of roots by gravity, whilst a half-turn brings it back again to filling position. The machine requires no



"Cataract" Root washer and peeler.

stand, and can be rolled from place to place, on the rims *H*, just like an ordinary barrel. The water is drawn into the barrel in streams during rotation, instead of being expelled by centrifugal action, and this, the makers claim, enables roots to be cleaned in less than half the time occupied by other methods. By placing perforated metal strips on the slats of the barrel, the machine becomes an abrasive potato and root peeler.

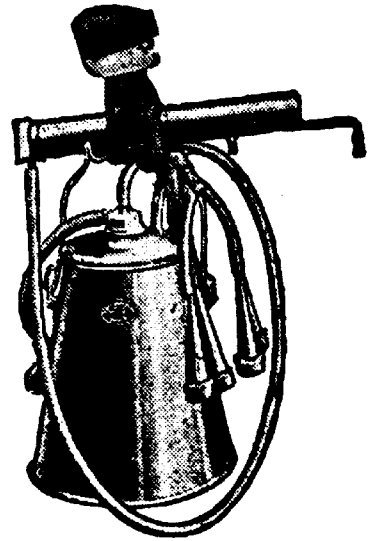
For dealing with large quantities of roots a power machine is made.

273 **Hinman Mechanical Milkers.** — *Farm Implement News*, Vol. XXXVII, No. 49, pp. 30–31, 1 fig. Chicago, Ill., December 7, 1916.

Following the idea that a simple milking machine could be made tight enough to exclude all outside contamination without using a vacuum in the pail and still insure purer and more sanitary milk, the inventors, HINMAN, father and son, have built a milking machine of extreme simplicity.

The Hinman milker has no pulsating mechanism, no air pipe lines, no vacuum tanks. It is just a simple combination of pump, vacuum in valve chamber in pail cover, and natural pressure in teat cups. The

pump is a simple one piece type, operating at slow speed with long stroke, producing the exact amount of vacuum required with no possibility of too much pressure. The vacuum is in the valve chamber in the pail cover. This chamber has but one moving part. The weight of milk opens the valve or disk when suction is stopped. This regular action also helps



Single-unit HINMANN Milker.

the natural action in teat cups so that the circulation of blood in the teats is normal. The teat cup is not a rubber sack, but simply a pure rubber ring slipped over a metal cup. It is natural and gentle in action and more uniform than the human hand.

This machine is constructed by the "Hinmann Milking Machine Co.", Dept. 2, Oneida, N. Y.

274 - **Test of Mechanical Cultivators in the Department of the Indre, France.** — DISSOUBRAY, J., in *La Vie agricole et rurale*, Year 6, No. 53, pp. 482-484. Paris, December 30, 1916.

Public trials of tractors were organised from September 18 to 25, 1916, by the Breeders' and Agricultural Societies of the Department of the Indre. The four localities of Issoudum, Vatan, Levroux and Buzançais were chosen

The bad weather and unsuitable state of the ground did not allow the trials at Vatan to be well carried out. The general results of the trials are as follows:

MACHINES HAVING TAKEN PART IN THE TRIALS:

1) EMERSON tractor, 10-20 HP, carrying a 3-furrow plough, lifting automatically and with circular coulters.

2) *Bull* tractor, 8-16 HP, with 2-body gang-plough, lifting automatically and with circular coulters.

3) Two *Mogul* tractors, 8-16 HP, one with a 2-body plough, the other 3-body; both lifting automatically and with circular coulters.

4) *Titan* tractor, 15-20 HP, with a 4-body plough, lifting automatically and with circular coulters.

5) CASE tractor, 12-15 HP, with a 4-body plough, lifting automatically and with circular coulters.

The CASE tractor only took part in the Vatan and Levroux trials; the *Titan* tractor only took part in the Vatan and Buzançais trials; the *Mogul* tractor No. 2, only took part in the Levroux and Buzançais trials.

Issoudun (*Villaine Farm*). — The field, which had carried potatoes and beets in 1915, had not been cultivated for a year; the soil was covered with weeds, but not so much as to form a turf. The soil is a stony limey-clay, a pronounced type of the so-called "Grouaille" soil; at some points, rock is near the surface and cultivation never goes deeper than 4 to 5 inches.

Levroux (*Marmagne Farm*). — Old oat stubble with patches of brambles whose spreading stems covered the soil; the soil is pratically level and the furrows are about 650 yards long. The soil is a sandy clay, of the soft soil called "Beauce" in a most favourable condition of humidity for working.

Buzançais (*Brosse Farm*). — The field, recently under crimson clover sown down on wheat stubble, had not been worked since the autumn of 1914. As it was to be sown with wheat, it had been dressed with well-rotted manure which clogged the tractor-wheels and decreased their adherence. The soil was rather dry. The field was irregular and in some parts the furrows varied from 170 to 218 yards in length. The soil was like that of Villaine ("Grouaille" soil), calcareous clay, but with fewer large stones and the rock further away from the surface; the soil had been broken up some 12 years before, when sugar-beet was grown.

The general results of the trials are shown in Tables I and II. The cost of fuel per acre was based on the prices of 2 *s.* 7 ½ *d.* per gallon of petrol and 1 *s.* 6 ¾ *d.* per gallon of paraffin.

TABLE I. — *Cubic content of earth stirred, consumption of fuel and cost price of labour per acre.*

Tractors	Earth moved in cu. ft.			Fuel, in galls.			Cost per acre in £ s. d.		
	Issoudun	Levroux	Buzançais	Issoudun	Levroux	Buzançais	Issoudun	Levroux	Buzançais
Bull	42 380	60 034	49 444	8. 8	8. 36	9. 48	9s. 7d.	9s. 2d.	10s. 7d
CASE	—	60 034	—	—	5. 89	—	—	—	—
EMERSON	42 380	1 250	60 034	8. 02	7. 44	9. 02	9s. 9d.	9s. 0d.	9s. 9
Mogul No. 1	56 507	60 034	56 507	13. 2 Paraffin	12. 91	15. 07 Paraffin	8s. 8d.	8s. 2d.	9s. 8
Mogul No. 2	—	56 507	45 912	—	8. 55	11. 74 Paraffin	—	£1 1. 5d.	7s. 9
Titan	—	—	56 507	—	—	10. 72	—	13s. 3d.	11s. 8

TABLE II. — *Cost of Petrol or Paraffin for 1 acre cultivated to a depth of 5 inches.*

Tractors	Galls used, per acre			Cost of fuel		
	Issoudun	Levroux	Buzançais	Issoudun	Levroux	Buzançais
Bull	3. 56	2. 39	3. 36	9s. 7.5d.	8s. 4.5d.	9s. 1
CASE	—	1. 68	—	—	4s. 6.5d.	—
EMERSON	3. 24	2. 89	4. 1	8s. 9d.	7s. 10d.	12s. 0
Mogul No. 1	4. 008 Paraffin	3. 69	4. 58 Paraffin	6s. 6d.	10s. 0d.	7s. 5
Mogul No. 2	—	2. 33	4. 39 Paraffin	—	6s. 3d.	7s. 1.5
Titan	—	—	3. 25	—	—	8s. 9

275 – Review of Patents.

Tillage Machines and Implements.

Austria

72 438 Device for regulating the height of the plough-body in motor plough.

72 545 Disc harrow.

72 903 Cultivator.

72 908 Harrow.

France	481 344	Vine cultivator.
	481 538	Implement for cultivating between the rows of vines.
	481 813	Motorplough adaptable to various kinds of work.
Germany	294 157	Tillage Implement with an implement frame carried by arms oscillating laterally.
	294 408	Motor plough with a driving-wheel placed in a movable frame in front of the machine.
	294 744	Motor plough with the chassis for the plough-bodies attached by an articulated parallelogram.
Switzerland	74 412	Motor-plough.
United Kingdom	13 661	Harrow.
	13 779	Motor-plough.
	102 376	Gang-plough.
United States	1 204 422	Cultivator or Harrow.
	1 204 566 — 1 207 433	Plough attachment.
	1 204 603	Depth-equalising shovel-beam attachment for cultivators.
	1 204 828 — 1 207 640 — 1 207 686 — 1 209 368 — 1 209 898 — 1 210 249 — 1 210 338 — 12 210 350	Ploughs.
	1 206 517	Back-to back-plough.
	1 206 945	Tillage Implement.
	1 207 310	Rotary plough.
	1 207 430	Plough-lift.
	1 207 539 — 1 208 856	Motor-ploughs.
	1 207 579	Rotary harrow.
	1 207 984	Combination farming-machine.
	1 208 380	Method for attaching ploughs.
	1 208 434	Adjustable riding-cultivator frame.
	1 208 599	Leveller and pulveriser.
	1 208 856	Motor-driven tilling machine.
	1 209 066	Maize plough.
	1 209 072	Combined garden-weeder and pulveriser.
	1 209 467	Roller attachment for listers.
	1 209 543	Land-marker.
	1 209 565	Harrow.
	1 209 897	Steam-plough.
	1 210 092	Weeder.

Drainage and Irrigation.

Austria	72 431	Watering apparatus.
Germany	294 289	Automatic waterer for gardens.
	294 457	Digger with oscillating forks.
United Kingdom	13 221	Spraying machine for water and other liquids.

Manures and Manure Distributors.

Austria	72 905 — 72 909 — 73 016	Manure distributors.
Denmark	21 758	Manure distributor.

Germany	294 352	Manure spreader with mixing drum.
	295 260	Machine for spreading farm-yard manure.
Switzerland	74 340	Method of preparing peat for use as a manure.
United Kingdom	14 487	Methods of producing fertilisers by acting on peat: *a*) with ammonia and calcium carbonate; *b*) with ammonium sulphate and an alkali.
United States	1 207 000 — 1 207 086	Manure spreaders.
	1 209 092	Fertiliser spreader.
	1 209 532	Straw and manure spreader.

Drills and Sowing Machines, etc.

Austria	72 432	Potato-planter.
	72 550	Drill for any kind of seed.
	72 551	Drill with regulator for the seed sown.
	72 692	Drill, specially for gardens, with coulters that can be set to one side.
France	481 837	Machine for singling and hoeing vegetables planted in lines
Germany	294 288	Potato-planter with bucket-wheel.
	294 970	Potato-planter.
United Kingdom	12 860	Lawn-mowers.
United States	1 204 840	Maize-cultivator.
	1 207 094 — 1 207 445	Cotton-cultivators.
	1 207 473	Maize-planter harrow.
	1 207 557	Marker for maize-planters.
	1 207 890	Maize-planter.
	1 208 514	Machine for removing surplus plants.
	1 209 138	Potato-planter.
	1 209 329	Seed-planter.
	1 210 185	Sugar-beet cultivator attachment.

Control of Diseases and Pests of Plants.

Austria	72 507	Method for preparing a dry antifungus remedy giving emulsion of copper oxychloride with water.
	72 715	Method for destroying clover dodder.
	73 011	Carbon bisulphide injector.
France	470 538	Sprayer or sulphater using a bicycle pump and valve of the same bore) as supply control; for agricultural and for disinfecting premises.
	481 703	New removable, non-choking, bung-valve for sprayers sulphating vines.
Germany	295 001	Balance-trap for gnawing animals.
	295 261	Insecticide.
United Kingdom	102 449	Weed destroyer.
United States	1 204 772	Weed cutter and sprayer.
	1 209 072	Combined garden-weeder and pulveriser.

Reapers, Mowers and Harvesting Machines.

ustria	72	906	Combined reaper and thresher.
	72	911	Reaper with 2 superimposed cutting-bars.
	72	913	Reaper.
	72	914	Binder and swathe former for reapers.
	73	014	Adjustable hay-maker with combined drum and swathe-turner.
ermany	294	354	Mower with two knives with a to-and-fro motion.
	294	409	Protector for knife-beam of mower.
	295	111	Mower with frame carrying the knife-beam, both of which can turn round a common axis in the longitudinal plane of the machine.
nited Kingdom	12	639	CARNE (1) hay-rake.
	13	172	Flax-pulling Machines.
nited States	1 204	403	Grain-harvester and binder.
	1 204	441	Grain-lifter for harvesters.
	1 204	460	Hay-rake.
	1 204	536	Harvester.
	1 204	557	Harvesting machinery.
	1 204	661	Hay-cocker.
	1 208	591	Cotton-harvester.
	1 209	519	Combination mower.
	1 209	558	Mowing-machine.

Machines for Lifting Root Crops.

ustria	72	434	Turnip-topper.
	72	542	Beet-harvesters.
	72	546	Potatolifter with delivery wheel.
	72	547 — 73	013 Potato-lifters.
enmark	21	317	Root-topping machine.
ermany	294	357	Root-topping machine.
nited Kingdom	13	741	Root-lifting machine.
	13	786	Root-topping machine.
nited States	1 204	627	Beet-topper and digger.
	1 205	060 — 1 207	889 — 1 209 055 — 1 210 057 Beet-harvester.
	1 206	893	Peanut-digger.

Threshing and Winnowing Machines.

tria	72	433	Thresher.
ombia	1	250	Thresher.
many	294	410	Thresher.
	295	232	Straw-shaker for beater.
	295	343	Oscillating shaker for beater.

(1) See *R.* January 1917, No. 74.

United States 1 209 114 Seed-cotton cleaner.
1 209 707 Straw carrier and grain-separator.

Machines and Implements for the Preparation and Storage of Grain, Fodder, etc.

Germany 294 355 Apparatus for emptying barns.
294 356 Straw elevator.
294 919 Straw-chopper.
294 943 Ungearing mechanism for chop-cutters.
295 000 Machine with circular saws for cutting poppy-heads.
295 055 Device for fastening ends of wires in baling-presses.
295 085 Spurrey-cutter.
295 210 Dust-aspirator for chop-cutters, etc. (1).
295 366 Potato-sorting machine with oscillating suspended riddles.
United States 1 205 090 — 1 208 466 Hay-press.
1 207 189 Maize husking and shredding machine.
1 207 578 Hay-stacker.
1 208 988 Straw-stacker.
1 209 873 Hood for pneumatic stackers.

Forestry.

Austria 72 697 Tree-felling saw.
France 481 733 Method for felling and sawing up timber.
Germany 294 949 Method or apparatus for extracting the sap or resin from tree stumps.

Steering, etc. of agricultural machinery.

United States 1 204 516 Caterpillar tractor.
1 206 895 — 1 207 875 — 1 208 062 — 1 208 381 — 1 208 657 — 1 209 900 — 1 209 815 Tractors.
1 207 335 Four-wheel drive for tractors.

Feeding and Housing of Livestock.

Austria 73 078 Tying-up device for stables, etc.
Germany 294 458 — 294 674 Fixing horse-shoes.
294 513 Fixing horse-shoes without nails.
295 330 Claw-shoes for cracked heels.
United States 1 204 707 — 1 207 096 — 1 209 832 Pig-oilers.

Aviculture.

Germany 294 360 Poultry-pen door.

(1) See *B*, February 1917, No. 180.

Apiculture.

istria	72	541	Tool for uncapping honeycombs.
rmany	294	361	Hive with more or less oval brood cells surrounded by honey receptacles.

Fisheries.

nce	481	734	Spring pivoting drum for casting for fishing.
rmany	294	362	Eel-net.
	294	363	Drag-net.
	295	316	Artificial bait.

Farm Buildings.

stria	72	699	Shippon with device for bringing and distributing litter and food.
rmany	294	832	Stable fittings.
	294	944	Hot-bed covering with device for the simultaneous opening of a large number.
	294	954	Winter-covering for hot-beds, etc.

Dairying.

rmany	295	056	Teat-cup for milking machine
	295	344	Centrifugal separator with churn.
itzerland	74	325	Butter-making machine.
	74	326	Apparatus for killing injurious germs in milk, etc.
	74	327	Hygienic receptacle for boiling milk.
ited Kingdom	13	308 — 102	333 Churns.
	102	204	Milk-can.
	102	453	Method for preserving Cheddar cheese.
ited States	1 210	304	Milking machine.

Various.

ce	481	874	Shoe-protector for use with shovels.

RURAL ECONOMICS.

- **The Normal Day's Work of Farm Implements, Workmen, and Crews in Western New York.** — Mowry, H. H., in *United States Department of Agriculture, Bulletin* No. 412 (Professional Paper of the Office of Farm Management). Washington, D. C., September 22, 1916.

The Office of Farm Management of the United States Department Agriculture has published the results of information obtained from

farmers in Wayne, Ontario, Monroe, Tenesee, Livingston, Orleans and Niagara Counties. The summary of these data is given in Table I, which also gives the averages for the entire United States as determined by a survey made by the Department of Agriculture. This table gives the average daily work accomplished by the principal machines drawn by 2 or 3 horses and the work done by each man in the course of the different agricultural operations.

TABLE I. — *Summary and Comparisons.*

Operation	Average daily duty	
	Western New York	United States
	Acres	Acres
Walking plough:		
2 horses, 12-inch	1.65	1.76
3 horses, 14-inch	1.78	2.32
Sulky plough, 3 horses, 14-inch	2.20	2.40
Spike-tooth harrow:		
2 horses, 8-foot	13.0	10.8
3 horses, 10-foot	17.3	15.3
Spring-tooth harrow:		
2 horses, 6-foot	9.0	7.4
3 horses, 6-foot	10.2	8.2
4 horses, 8-foot	14.7	13.1
Disk harrow, fresh ploughed land:		
2 horses, 6-foot	7.5	7.2
3 horses, 6-foot	8.2	7.5
4 horses, 8-foot	11.1	12.8
Land roller 2 horses, 8-foot	13.8	13.2
Grain drill 2 horses, 6-foot	10.0	8.8
Grain binder 3 horses, 6-foot	10.4	11.1
Setting up bound grain, 1 man	7.5	9.3
Planting corn:		
Hand planter, 1 man	3.4	4.4
1 horse, 1 row	5.2	6.9
2 horses, 2 row	10.7	13.6
Cultivating:		
1 horse	4.1	4.4
2 horse	6.8	6.6
Cutting corn by hand, 1 man, yield 41-60 bushels	1.1	1.5
Setting up corn after corn binder, 1 man	3.4	4.0
Corn binder:		
2 horses	5.3	6.0
3 horses	5.7	7.3
Mowing hay (5-foot cut)	9.0	8.9

	Average daily duty	
	Western New York	United States
	Acres	Acres
aking hay (10 feet wide):		
1 horse	15.0	16.3
2 horses	17.6	17.9
Tedding hay, 2 horses	14.3	14.5
Cocking hay, 1 man	6.3	6.3
'auling hay from field to barn, 2 men and 2 horses:		
Unloading by hand	4.9	4.4
Unloading with sling	6.6	6.1
icking apples:		
Yield 1-10 bushels	52.3 bushels	34.0 bushels
Yield over 10 bushels	70.0	44.80
Husking corn from shock, 1 man	32.2	45.9
Threshing wheat from shock, 10 men and 6 horses	25.1	29.5
Hauling manure with spreader	14.7 loads	13.1 loads

Farm land in the section where these data were obtained is somewhat rolling, but ot to an extent to reduce appreciably the average amount of work that can be done ily. Some of the heavier soils reduced the amount of work that can by done daily ith ploughs. The horses used in Western New York average 1211 pounds in weight. he average net day in the field in spring and summer work was found to be 9 hours nd 38 minutes, and in haying and harvest it is 9 hours and 49 minutes.

The depth ploughed on stubble is on an average 6 6½ in. and 2 horses are generally sed; the ploughing on sod ranges from 6½ to 7¼ inches and 3 horses are usually mployed for this work. Owing to the heavy character of the local soils, the farmers in Western New York accomplish only about 80 to 85 per cent as much daily in their loughing work as does the average farmer in the United States.

The average data for ploughing on sod and on stubble are given in Table II.

TABLE II. — *A fair day's work for walking ploughs and sulky ploughs in Western New York.*

	Horses	Width	On sod		On stubble	
			Acres	Number of farms averaged	Acres	Number of farms averaged
		inches				
of walking ploughs	2	10	1.46	124	1.66	220
	2	12	1.47	217	1.65	315
	2	14	1.48	111	1.72	135
	3	10	1.70	86	1.82	52
	3	12	1.74	225	1.85	146
	3	14	1.78	198	1.93	140
	3	16	1.90	45	1.95	15
of sulky ploughs	3	12	1.95	86	2.11	86
	3	14	2.08	105	2.20	115
	3	16	2.26	51	2.37	42

The spike-tooth or smoothing harrow can be worked with 2-horse or 3-horse teams in a wide range of widths, as it is an implement of comparatively light draft. Three horses accomplish from 10 to 15 per cent more work on the same width of harrow than 2 horses.

Where 2 horses are required to draw widths greater than 10 ft., they appear to be overloaded, or that their daily efficiency is reduced. On hard soil, a 4-horse team find an 8-foot or 9-foot spring-tooth harrow a heavy load. With 2 or 3 horses, any increase in width results in less speed and mileage per day. Tables III and IV give an average day's work for harrow.

TABLE III. — *A fair day's work for spike-tooth and spring-tooth harrows.*

	Width	2-horse teams		3-horse teams		4-horse teams	
		Acres	Number averaged	Acres	Number averaged	Acres	Number averaged
	Feet						
Work of spike-toothed harrow	5	11. 2	15	11	2	—	—
	6	11. 1	87	11. 9	27	—	—
	7	12. 0	102	13. 2	33	—	—
	8	13. 0	199	14. 1	75	—	—
	9	13. 8	43	16. 4	48	—	—
	10	16. 1	102	17. 3	80	—	—
	12	14. 8	20	19. 1	38	—	—
Work of spring-toothed harrow	6	9	36	10. 2	33	—	—
	7	9. 3	6	10. 9	21	—	—
	8	9. 7	7	13. 3	10	14. 7	3
	9	—	—	—	—	18. 0	8

TABLE IV. — *A fair day's work for disk harrows using teams of two, three and four horses respectively.*

Horses	Width	On fresh-ploughed land		On well-packed land	
		Acres	Number averaged	Acres	Number averaged
	Feet				
2	5	7. 1	60	8. 4	61
2	6	7. 5	152	9. 1	149
2	7	7. 8	44	9. 6	44
2	8	7. 8	38	10. 0	38
3	5	8. 1	44	9. 4	44
3	6	8. 2	205	9. 8	201
3	7	8. 1	90	9. 9	89
3	8	8. 8	48	10. 3	49
4	6	7. 6	16	9. 1	155
4	7	9. 8	15	12. 2	15
4	8	11. 1	25	13. 3	25

The data of land rolling are given in Table V.

TABLE V. — *A fair day's work for the land roller drawn by 2 horses.*

Width	Acres	Number averaged
Feet		
6	11.4	76
7	12.5	255
8	13.8	588
9	14.0	117
10	14.6	136
12	15.3	23

GRAIN DRILL. — Out of 1 113 farmers, 951 use a 2-horsed grain drill sowing 11 ows; 67 use a 2-horsed grain drill sowing 10 rows and 95 a 2-horsed grain drill sowing 9 ws: these sow respectively 10.0; 9.6; and 9.2 acres daily.

GRAIN BINDERS. — Out of 1 144 farmers, 901 use a 3-horsed 6-foot binder, reaping nd binding on an average 10.4 acres daily; 83 have a 3-horsed, 7-foot binder reaping nd binding on an average 11.3 acres daily; only 16 farmers use 2-horsed, 5 foot binders, aping and binding 7-6 acres daily; 71 others reap and bind 9-3 acres a day with a 2-horse, -foot binder, while 73 reap and bind 9-6 acres a day with a 3-horsed, 5-foot binder.

SETTING UP SHOCKS AFTER A GRAIN BINDER. — Table VI shows the average acres f grain that a man can put up in shocks after a grain binder.

TABLE VI. — *A fair day's work for a man setting up grain in shocks after the grain binder.*

Yield		Acres	Number averaged
Straw	Grain		
Tons	Bushels		
1.3	20	7.7	278
1.4	25	7.6	380
1.6	30	7.4	313
1.7	35	7.3	25

The bulk of straw influences the daily acreage to some extent.

THRESHING WHEAT. — The amount of grain threshed daily is determined by the yield f the crop more than by any other condition.

TABLE VII. — *Threshing wheat from shock. — A fair day's work with average crews.*

Yield	Crew		Bushels daily	Acres daily	Number averaged
	Men	Horses			
Bushels					
0-20	8 or 9	4 or 6	561.7	24.3	124
21-30	9 or 10	6	715.3	25.1	244
31 and over	10 or 11	4 or 6	909.8	25.3	22

Table VIII gives the work of average crews in threshing from stack or barn, both for wheat and for oats.

TABLE VIII. — *Threshing wheat and oats from stack or barn. — Normal output of average crews.*

Crew		Wheat		Oats		
Men	Horses	Yield	Bushels	Yield	Bushels	Number averaged
—	—	—	—	—	—	—
8 or 9	2 or 4	20	733	35	1096	97
9 or 10	2 or 4	25	855	45	1296	107
9 or 10	2 or 4	30	914	55	1340	124

HANDLING MANURE. — Table IX shows the normal accomplishment to be expected from a manure-spreader operated by 1 man and using 2-horse and 3-horse teams respectively. The statistics obtained show that the great majority of farmers find 3 horses necessary for the operation of a spreader. The advantage of the spreader consists in the more even distribution of manure over the field, in the shorter time required to unload, and the greater ease of unloading by horse-power than by man-power. It takes about 2 ½ times as long to unload by hand as with the spreader.

On some farms the laborious work of handling manure from farm yards has been rendered unnecessary by the use of low-wheeled, low-priced waggons into which the manure can be emptied as it comes from the stable. The manure spreader can be set outside, so as to receive the contents of the carrier.

By hauling the spreader to the field as soon as filled, the laborious operation of loading from the ground by hand is eliminated and the manure goes directly to the field with a minimum of loss by leaching.

TABLE IX. — *A fair day's work in handling manure with a manure spreader.*

Horses	Rods hauled	Pounds in load	Loads hauled	Acres covered	Number averaged
—	—	—	—	—	—
2	61. 2	2, 317	14. 5	1. 7	123
3	70. 4	2, 689	14. 7	1. 8	355

OPERATIONS ON THE CORN (MAIZE) CROP. — Table X gives the normal efficiency of hand planters, 1-row and 2-row planters and the grain drill in planting corn.

TABLE X. — *A fair day's work with the implements used in planting corn.*

Implement	Width of rows	Acres daily	Number averaged
—	—	—	—
	Inches		
Hand planter	36	2. 9	74
	42	3. 4	113
One row, 1-horse planter	36	4. 6	62
	42	5. 2	93
Two rows, 2-horse planter	36	9. 1	84
	42	10. 7	124
Grain drill, 2 horses	36	11. 3	192
	42	11. 6	533

The hand planter is about 60 per cent as efficient as the 1-horse planter, $^1/_2$ as efficient as the 2-row planter and $^1/_4$ as rapid as the grain drill.

As for cultivating, the 2-horse walking cultivator is about 50 per cent more efficient than the 1-horse cultivator, and the 2-horse riding cultivator is about 75 per cent more efficient than the 1-horse type and 13 per cent more efficient than the 2-horse cultivator. The statistical data on this subject are to be found in Table XI.

TABLE XI. — *A fair day's work in cultivating corn.*

Horses used	Type of cultivator	Acres cultivated daily	Number averaged
1	Walking	4. 1	1 077
2	do	6. 2	560
2	Riding	7. 1	1 133

Table XII gives the average acreage of corn cut by one man working with a corn knife, in one day in terms of ears per acre. The averages for New York for this operation are about 25 per cent less than the normal for the United States, the yield being the same. This may be accounted for in part by the fact that corn in New York is planted in drills instead of in hills, requiring more blows of the knife to cut a given number of stalks; also because a short-handled sickle is used in the East which requires much stooping, while a long straight-bladed knife in used in the West, which permits the work to be done while standing practically erect.

TABLE XII. — *A fair day's work for one man in cutting corn by hand.*

Range of yield (Bushels of ears) *	Acres cut daily	Number averaged
Under 40	1. 3	47
41-60	1. 2	187
61-80	1. 1	402
81 and over	1. 1	580

* To convert to bushels of shelled corn divide by 2.

Where corn has been cut by a corn binder, a man's efficiency in setting it up in hocks in multiplied by 3 over what he can accomplish in cutting and setting up by hand. Table XIII gives the day's work for a man setting up corn after the corn binder.

TABLE XIII. — *A fair day's work for a man setting up corn after the corn binder.*

Yield per acre (bushels of ears)	Acres per day	Number averaged
50	3. 5	102
75	3. 4	165
100	3. 3	474

Table XIV shows the day's work of a corn binder. It is about 20 per cent less than the average for the United States. This is in part accounted for by the fact that corn is not extensively grown in New York but more intensively. The methods of sowing already mentioned have also something to do with the matter.

TABLE XIV. — *A fair day's work with the corn binder drawn by 2 and 3 horses respectively.*

Horses	Acres cut daily	Number averaged
2	5.3	190
3	5.7	1001

In husking corn from the shock in West New York, one man averages only from 65 to 75 per cent of the average for the United States (owing to reasons already stated) about 35 bushels per day being the normal amount husked per day in this section. This is shown by Table XV.

TABLE XV. — *A fair day's work for a man husking corn from shock.*

Range of yield (bushels of ears)	Acres per day	Bushels per day	Number averaged
Under 41	0.66	36.3	26
41-60	0.62	32.2	122
61-80	0.47	32.6	293
81 and over	0.40	36.0	431

OPERATIONS ON THE BEAN CROP. — Beans are planted with a grain drill, cultivated with an ordinary cultivator, and harvested with a bean harvester, an implement drawn by 2 horses and having 2 long knives, each of which cuts a row, the 2 rows being thrown in the centre between the rows. The beans are then thrown into small piles with a pitchfork and from time to time the piles are forked and turned over, so that the pods will dry out and cure suitably for threshing. The data of these operations are found in Table XVI.

TABLE XVI. — *A fair day's work for the operations in bean-growing.*

Operation	Horses	Men	Acres daily	Number averaged
Planting with grain drill	2	1	10.9	1040
Harvesting with bean harvester	2	1	7.6	982
Bunching with fork	—	1	2.8	793
Forking with fork	—	1	2.7	819

HAYING OPERATIONS. — The data relating to these are set forth in Table XVII.

TABLE XVII. — *Carting the bean-crop.*

Crew			Area carted per day	Number averaged
Men	Horses	Wagons		
2	2	1	5.51	459
3	2	1	6.5	355
4	4	2	10.28	64
5	4	2	10.89	35
6	4	2	12.18	17

TABLE XVIII. — *A fair day's work for implements, men and teams used in making hay.*

Operation	Men	Horses	Width	Acres daily	Number averaged
			Feet		
Mowing	1	2	4 ½	8.3	32
			5	9.0	974
			6	10.2	195
Raking	1	1	10	15.0	175
		2	10	17.6	424
Bunching	1	1	10	13.1	89
		2	10	16.3	164
Tedding	1	2	—	14.3	658
Cocking	1	—	—	6.3	1 044

Table XIX shows the day's work of the crews ordinarily used in New York in hauling and unloading hay.

TABLE XIX. — *A fair day's work with crews used in hauling hay from field to barn and unloading by hand.*

Crews			Tons daily	Acres daily	Number averaged
Men	Horses	Waggons			
2	2	1	7.7	4.9	342
3	2	1	8.8	5.3	509
3	4	2	10.0	5.6	11
4	4	2	13.3	7.7	50
5	4	2	14.8	8.7	65

Unloading with hay sling, or hay fork, increases the efficiency per day about 45 per cent, as is shown by Table XX.

TABLE XX. — *A fair day's work for crews hauling hay from field to barn and unloading with hay sling, or fork.*

Crews			Tons daily	Acres daily	Number averaged
Men	Horses	Waggons			
2	2	1	10.7	6.6	290
3	2	1	11.6	7.5	496
3	4	2	14.9	9.3	9
4	4	2	17.5	9.8	58
5	4	2	20.1	11.7	82

The efficiency of the crews can be increased about 10 per cent by the use of the hay loader in the field. Where stacking is done in the field, or where the hay field is

within 60 rods of the barn, hay can be put away about 75 per cent more rapidly with the over-shot stacker (used for stacking) and the sweep rake (for collecting) than with waggons and racks. The stacker and sweep rack are usually employed in the Western States.

OPERATIONS ON THE CABBAGE CROP. — Table XXI gives the data respecting planting cabbages with a transplanter; there must be always 3 men on this machine. The additional men (who are alone entered in Table XXI) are used to bring plants and water to convenient points for the transplanter. The efficiency per day is not greatly increased by additional men, 2 men and 2 horses adding only about 15 per cent to the amount done daily by 1 man and 1 horse. Two extra men and an extra team are, however, used more frequently than smaller numbers.

TABLE XXI. — *A fair day's work in setting cabbage, using 3 men on the transplanter and additional men and horses as indicated.*

Extra men	Extra horses	Acres planted daily	Number averaged
—	—	3.4	53
1	—	3.4	42
2	—	3.5	65
1	1	3.5	47
2	1	3.7	83
1	2	3.8	30
2	2	4.0	155

Table XXII gives the average number of loads and tons of cabbages that can be harvested daily and unloaded on the farm. The smaller crews are most frequently used as the larger ones do not give results corresponding.

TABLE XXII. — *A fair day's work for crews harvesting cabbage and sorting in the barn.*

Crews			Loads daily	Tons daily	Number averaged
Men	Horses	Waggons			
2	2	1	7.4	9.8	142
3	2	1	8.0	11.4	107
4	2	1	9.4	13.5	50
4	4	2	12.3	16.4	48
6	4	2	14.9	20.7	16

Table XXIII shows the number of loads that can be handled daily with the respective crews where the cabbage is hauled directly from field to market. On account of its great weight and bulk, cabbage is not grown to any considerable extent except on farms 2 or 4 miles from shipping point.

TABLE XXIII. — *A fair day's work for crews harvesting cabbage and hauling directly to market-loads per day.*

Crews			Miles to Market									
			1		2		3		4		5	
Men	Horses	Wagons	Loads	Number averaged	Loads	Number averaged	Loads	Number averaged	Loads	Number averaged	Loads	Number averaged
2	2	1	5.1	13	3.9	51	3.1	29	2.5	23	2.5	13
3	2	1	5.8	17	4.6	30	3.5	16	3.5	12	2.4	5
4	2	1	4.7	3	4.7	16	3.6	18	3.5	3	3.6	5
4	4	2	10.4	5	6.9	15	6.0	10	4.7	5	4.0	1
6	4	2	11.8	5	7.0	2	6.5	4	7.0	2	4.1	1

OPERATIONS ON FRUIT CROPS. — The data given in Tables XXIV and XXIX were obtained in Western New York under conditions where orcharding is on a commercial basis and the work is well standardised.

They refer to well-established orchards and the customary methods and practice which obtain among the vast majority of growers. Baldwins and Greenings predominate among the orchards. Trees are pruned quite regularly, few, if any, neglected orchard conditions and abnormal factors being incorporated in the averages.

TABLE XXIV. — *A fair day's work in pruning fruit trees and in thinning fruit from apple trees.*

Operation	Trees daily	Number average
Pruning apple trees (10 years old)	28.6	803
Pruning apple trees (30 years old)	12.6	769
Thinning out surplus apples (30 years trees).	12.4	528
Pruning peach trees (8 years hold)	37.7	449

Table XXV shows the number of bushels that one man can pick daily, where the yield of the tree varies:

TABLE XXV. — *A fair day's work for one man in picking peaches from trees of average size, according to yield per tree.*

Yield per tree (bushels)	Bushels picked per day	Number averaged
1	22.2	17
2	33.6	101
3	34.7	99
4	38.3	50
5	39.8	50
8	45.9	13
10	54.3	7

From Table XXVI it appears that about the same number of peaches can be handled daily by one man packing into baskets as can be picked from the tree. In general the smaller the basket, the less the quantity that can be packed in a day. The $^1/_3$-bushel basket is most commonly used.

Mechanical graders for sorting peaches were almost unknown in this area at the time these data were collected.

TABLE XXVI. — *A fair day's work for 1 man in packing peaches in baskets.*

Size of basket (bushels)	Number of baskets daily	Average bushels daily	Number averaged
$^1/_4$	88. 2	22. 1	17
$^1/_3$	97. 7	32. 6	266
$^1/_2$	79. 5	39. 7	44
1	57. 6	57. 6	15

Table XXVII gives the daily duty of one man in picking apples. In good years pickers prefer to be paid by the bushel or barrel, and work more rapidly than when paid by the day. Under average conditions in the Western New York territory, the yield of apples is from 4 to 6 bushels per tree, and the average picker gathers from 20 to 25 barrels daily.

TABLE XXVII. — *A fair day's work for a man in picking apples.*

Yield per tree (bushels)	Bushels per day	Number averaged	Yield per tree (bushels)	Bushels per day	Number averaged
6	53. 2	11	20	66. 9	207
10	54. 5	88	25	75. 8	81
15	63. 5	199	30	78. 6	150

Mechanical devices for sorting and packing apples are seldom used in Western New York. A simple barrel header worked by 1 man only is used.

When apples are sorted by hand and packed in barrels, the daily amounts set out in Table XXVIII should normally be accomplished.

TABLE XXVIII. — *A fair day's work in sorting and packing apples with the number of hands indicated.*

Crews		Barrels daily	Number averaged
Sorters	Packers		
1	1	56. 7	209
1	2	65. 4	11
2	1	77. 4	228
2	2	88. 7	118
3	1	98. 4	27
3	2	115. 0	37
4	2	124. 9	9

Not many of the commercial orchards in New York are over 6 miles from market. The number of trips that can be made daily with loads of fruit for distances from 1 to 8 miles is shown in Table XXIX. The usual load is 20 to 22 barrels of apples and 55 to 60 bushels of peaches.

TABLE XXIX. — *A fair day's work for man and team in hauling fruit to market.*

Miles to market	Loads per day	Number averaged	Miles to market	Loads per day	Number averaged
1	6.3	58	4	3.0	150
1 1/2	5.6	53	5	2.3	128
2	4.8	173	6	2.1	77
2 1/2	4.1	79	7	1.9	29
3	3.7	210	8	1.9	17
3 1/2	3.4	38	—	—	—

177 - **The Valuation of Feeding Stuffs.** — See No. 257 of this *Bulletin*.

178 - **Method for the Investigation of the Aniline Derivatives and Other Foreign Colours in Wine.** — MASONI, GIULIO, in *Le Stazioni sperimentali agrarie italiane*, Vol. XLIX, Part. 7-8, pp. 336-376. Modena, 1916.

In a preceding note (*Le Stazioni sperimentali agrarie italiane*, Vol. XLVIII, 1915), the author has described his method for investigation of aniline derivatives used for colouring red wines. The method is as follows:

In a measuring glass, pour 2 cc. of wine, add 2 cc. of 5 % potassium ferro-cyanide and 5 cc. of 15 % neutral lead acetate, heat to boiling for a few seconds, leave to stand.

A precipitate quickly settles, leaving a limpid liquid, colourless if the wine is pure, pink if the wine contains aniline colours. The test is very sensitive and shows the presence of these colours in amounts less than the minima necessary to produce a perceptible colour in the wine.

In previous experiments the writer only used wines at least 3 months old. In this second communication he indicates the results obtained with: white wines, very new wines; colouring matters of vegetable origin (elder, phytolacca, logwood, bilberry, sunflower, caramel) and of animal origin (cochineal extract); other aniline colours besides those already tried, such as: *reds*, fuchsine — safranine — malveine — Bordeaux B — Bordeaux B. S. — poppy 3 R. — erythrosine — azorubine — eosin red — xylidine scarlet — croceine scarlet 3B — Magdala red — true red — *yellows*, chrysaniline, vesuvine — tropeoline 1000 — tropeoline 00 — Martius yellow — Victoria yellow — naphtol yellow — solid yellow — aurantia.

New pure wines with this method give: a violet red liquid for red wines; a yellowish liquid with white wines; the reaction is only applicable to them if the ferrocyanide solution is rendered alkaline by adding 2 % of soda, so that pure wines give a colourless liquid and that the method can be used. The alkalinity does not interfere with the reaction. The article contains a table showing the colours of the lacs and of the liquids obtained from wines containing one of the various colouring matters under discussion.

279 - **The Sugar Industry in Russia.** — KRIOUKOV, N. A. in *The Agricultural Gazette*, Nos. 35 to 41, pp. 945-948; 976-978; 998-1000; 1018-1020; 1041-1043; 1065-1066; 1085-1086. Petrograd, 1916.

AREA UNDER SUGAR BEET AND THE SUGAR PRODUCTION. — In Russia there are 13 regions where sugar beets are grown:

1) *The South-western*, including the Governments of Kiev, Volhynia, Podolia, Cherson and Bessarabia;

2) *The Central*, including the Governments of Koursk, Poltava and Tchernigov;

3) *The Eastern*, including the Governments of Voronej, Tambov, Orel and Toula;

4) *The Polish*, including the Governments of Warsaw, Kalich, Lublin, Cholm, Lomja, Petrokov, Plozk and Radom.

During the 25 years period between 1887-1888 and 1911-1912, the following changes have taken place in the *area under sugar beet* and in the *general production* of this plant.

Regions	Area Under Sugar beets (1)			Total production in quintals (2)		
	in 1887-1888	in 1911-1912	% of increase	in 1887-1888	in 1911-1912	% of increase
South-Western. .	137 387 ha	441 865 ha	222	152 180	516 503	239
Central.	62 247 »	234 207 »	276	82 148	260 728	217
Eastern.	14 153 »	34 254 »	142	14 480	26 375	82
Polish	34 771 »	77 382 »	123	37 259	98 293	164
Totals. . .	248 558 ha	787 708 ha	217	286 067	901 900	214

(1) 1 hectare = 2,471 acres.
(2) 1 quintal = 220 lbs.

The figures given in this Table show the importance of each region and the amount of progress made.

The South-Western region has the largest area under sugar beet, which amounted to 56 per cent of the total area in 1911-1912; next comes the Central region with 30 per cent, the Polish with 9.8 per cent, and lastly the Eastern with 4.2 per cent.

The *total area* under sugar beet has increased 217 per cent in 25 years, that is to say, it has been more than trebled; the *total production* has increased to almost the same extent.

The greatest extension of the area of sugar beet-growing has been in the Central Region (276 %), while the production has augmented most in the South Western. In the Polish Region, the area has increased 123 per cent, and the production 164 per cent.

The variations in the *unit production* of sugar beet during these 25 years (from 1887 to 1912) have been as follows:

In the South-Western Region	from	117	to	188	quintals per ha
» Central »	»	131	to	199	»
» Eastern »	»	78	to	168	»
» Polish »	»	143	to	245	»

(1 quintal per hectare = 0.79 cwt per acre).

Average in all Russia from 124 to 202 quintals per ha.

The sugar beet is cultivated in Russia in *3 categories* of *agricultural undertakings*, i.e. 1) sugar beet fields belonging to sugar factories; 2) large farms growing beets for the nearest sugar factory under fixed conditions; 3) small farms that happen to be situated near a sugar factory.

In 1912, *the total area under sugar beets* was divided amongst these 3 categories in the following manner:

Regions	Fields belonging to sugar factories	Large farms	Small farms
South Western	24.6 %	51 %	24.4 %
Central	46.7	36.3	17
Eastern	54	31	15
Polish	3.4	59.6	37
In all Russia	30.4 %	46.6 %	23 %

From Table II, it is seen that sugar beet-growing in fields belonging to the sugar factories is more developed in the Eastern region, where 54 per cent of the total area devoted to this crop is the property of the sugar factories. In the central region it decreases, and in the South Western, the sugar factory beet fields only occupy $^1/_4$ (24.6 %) of the whole area, while $^1/_2$ (51 %) belongs to the large farms.

Finally, in the Polish region, the sugar factories only cultivated 3.4 % of the total area under sugar beets, while 59.6 % of the area belong to large farms.

As for the *unit production* of the sugar beet, it is considerably lower on the small farms, as is shown by the data of 1912.

Regions	Large beet-growing farms and beet fields belonging to sugar factories	Small beet-growing farms
South Western	186 quintals per ha	141 quintals per ha
Central	176 » »	125 » »
Eastern	118 » »	104 » »
Polish	203 » »	167 » »

COST OF SUGAR BEET PRODUCTION. — In the South-Western region, the cost growing 1 ha of sugar beet was apportioned as follows, on an average, in 1910-1912.

Land improvement and rent	41 — 49 fr.
Manures	17 — 19
Working the land	27 — 32
Sowing	6.1 — 7
Seeds	24 — 27
Hoeing	8.5 — 10
1st Singling	22 — 24
2nd Singling	12 — 15
Hilling up	3.7 — 5
Defence against agricultural pests	7 — 10
Harvesting	34 — 44
Transport to sugar factory	37 — 44
Sundry expenses	1.2 — 5
Total	240.5 — 291 fr.

With an average production of from 180 to 195 quintals per ha, the cost of producin 1 quintal of sugar beets amounts to 1.48 — 1.57 fr.

SUGAR FACTORIES AND REFINERIES. — The number of sugar factories in Russi during the last 27 years, was as follows:

In 1887 sugar factories doing business	218
» 1912 » »	281
» 1913 » »	288
» 1914 » »	292

The following data show how the *sugar factories were divided amongst the differ regions*, and also their output:

Region	No of factories	Total sugar output, thousands of quintals
South Western	145	1 096
Central	71	5 792
Eastern	15	537
Polish	50	1 988
Totals	281	18 413

It is interesting to compare the data respecting the number and output of the sug factories with the following figures giving the *sugar yield* of the beetroots used during th different years:

Periods	Average yield of beets per ha.	Average yield of sugar per ha.	Sugar percentage
1887-1892	168 quintals	16 quintals	9.6 %
1892-1897	159 »	17 »	10.7 %
1897-1902	142 »	16 »	11.4 %
1902-1907	152 »	19 »	12.3 %
1907-1912	161 »	23 »	14.0 %

These data show that during the last 25 years, the sugar content of the beet has considerably increased; the average percentage having risen from 9.6 to 14 %, which means that the sugar yield per unit of area has increased about 1 1/2 times.

As for the differences in *sugar yield in the differents zones*, they were as follows for the season 1911-1912:

Regions	Sugar yield per ha.	Sugar percentage
South Western	23 quintals	13.1 %
Central	25 »	14.9 %
Eastern	16 »	13.7 %
Polish	26 »	14.0 %
Average for whole of Russia	24 »	13.6 %

The cost of producing 1 quintal of sugar during different periods was as follows

In 1893-1894	35.98 fr.
» 1899-1900	34.12
» 1905-1906	40.37
» 1909-1910	36.15
» 1911-1912	32.56

In Russia, a sugar factory which produces 50,000 quintals per year is considered one of average size.

It is necessary, in order to obtain this output, to have about 1 630 000 fr. of working capital, 32.50 fr. per quintal of sugar. The value of this sugar factory is estimated at 666 000 fr.

With regard to the *sugar consumption* per head in Russia, it was: 2.8 kg in 1887-1888 - 6.8 kg in 1911-1912 — 7.2 kg in 1913-1914.

In normal times, Russia exported as *excess sugar production*: 544 000 quintals in 1887: 185 000 quintals in 1911-1912.

There are many refineries in the chief centres of sugar consumption, as for example Petrograd, Kiev, Odessa, etc. Many of the factories, however, have built refineries which form part of the main building.

According to the data of 1911-1912, the *output of refined* sugar was as follows:

	No.	Amount of refined sugar. Thousands of quintals
Refineries	19	5 081
Refineries attached to sugar factories.	47	2 862
Totals. . .	66	7 943

During the five-years period 1887-1892, the output of refined sugar amounted to 67 per cent of the whole quantity produced: in 1911-12 the percentage was only 44.

BYE-PRODUCTS OF THE SUGAR INDUSTRY. — In Russia, these are not yet used in a complete and systematic manner. At the present time, the value of these substances obtained per quintal of sugar is only 2.40-4.80 fr., while it could be raised to about 9 francs, as is shown by the example of other countries. The first steps in this direction

have been taken and further progress will certainly exert some influence on the cost of unit sugar production.

SUGAR BEET SEEDS. — For information on this subject, see article No. 234 of the *Bulletin*.

In conclusion, the writer also gives some account of the effect of the war upon the sugar industry in Russia.

280. - **The Utilisation of Milling Residues in Hungary** — I. ZEGEN, A., Vetch and Corn-Cockle Seeds from Siftings, in *Kisérletügyi Közlemények* (Bulletin of the Hungarian Agricultural Stations), Vol. XIX, Part 2, pp. 323-350. Budapest, July-September 1916. — II. GYÁRFÁS J., Cultural Experiments with Vetch seeds from siftings in Hungary. *Ibidem*, pp. 353-377.

I. — This article sets forth the data obtained in the course of many years experiments on milling residues; it is chiefly concerned with the answers to the following questions:

1) Are the products put on the market under the name of, " Vetch seed from siftings ", by the large steam mills of Hungary, and which are used as cattle food, or more recently for sowing, suitable for the latter purpose?

2) Upon what factors does their value depend?

The Budapest mills annually produce from 9 000 to 15 000 quintals of these residual vetch seeds, which represent from 0.5 to 0.6 per cent of the wheat ground.

The mills belonging to the " National Association of the commercial millers of the provincial towns " annually grind about 10 million quintals of wheat of which the vetch seed residue may be estimated at 20 000-30 000 quintals. In these mills, the wheat is freed from 0.2 to 0.4 % of vetch seeds on an average.

The writer had 10 samples of milling residues from 8 large mills at Budapest tested botanically. The results obtained are set forth in several tables, and show that under the name of " vetch seed from siftings ", are sold products consisting for the greater part (88.82 to 99.08 %) of the seed of wild plants of *Vicia sativa* and *V. segetalis*, as well as some of *V. striata* (= *V. pannonica*), all vetches which are very suitable for forage crops.

Vetch seeds from siftings contain, as a rule, but few foreign seeds, exceptionally these amount to 9 %. The analyses show that the cultural value of these siftings depends upon the number of valuable seeds they contain, and upon their degree of purity.

These vetch seeds are obtained fairly pure in the mills themselves by means of special cylindrical sorters. Since, however, vetch seeds are also sold coming from mills with less perfect apparatus, and which therefore have not undergone the same treatment, the Hungarian seed merchants have, for some time, cleaned the above mentioned products by passing them through spiral sorters.

Given the great difference in the market price of cultivated vetch seeds and that of the seed obtained from siftings, it is necessary to insist upon the latter being sold under their proper name, all the more so, since if they are to be used for sowing, these seeds have to undergo a special treatment before sowing, on account of the high percentage of hard seeds present.

As for some time past the vetch seed residues from the mills have been offered for

ale for sowing purposes, not only unadulterated but also mixed with the seed of ultivated vetches, and as it is very difficult to distinguish between these two kind of seeds, is necessary before purchase to consult a Seed Experiment Station.

The writer has also examined samples of corn-cockle (*Agrostemma Githago*) seed, (1) om 8 mills in Budapest. These were chiefly composed of fragments of grains of cereals, eeds of various species of wild vetch, corn-cockle seeds and, to a less extent, of foreign eeds. Since this milling residue contains many varieties of seed which diminish its utritive value, it is necessary to analyse it botanically before feeding it to cattle. Further, n account of the very variable number of corncockle seeds present in the siftings, only certain quantity proportional to the live weights of the cattle should be daily given to hem, in order to avid all risk of poisoning the animals.

In Hungary, the milling residues contain seeds of *Adonis aestivalis*; in a sample analysed by the writer there were as many as 3.8 %.

As this seed is generally considered poisonous, the Biological and Stock-Feeding tation carried out feeding experiments on a pig and a goose, using a ration of barley ixed with 4 % of *Adonis* seed. These animals ate the mixture very unwillingly and nly when driven to do so by hunger; they lost much live weight. However, after being d this ration for 16 days, they showed no symptoms, of poisoning. The great repu- nance which they manifested to the food, appears to have been due to the very large mount (20,53 %) of fatty oil present in the seeds of *Adonis*.

The latter seeds can easily be eliminated by employing spiral sorters, therefore the riter advocates their being removed from all corn-cockle seed used as a cattle feed.

The corn-cockle seed from the Hungarian siftings also nearly always contains seeds of *Lathyrus aphaca*, but their presence in very small quantities does not detract from the alue. In the samples examined by the writer, however, the seeds of *Lathyrus aphaca* mounted to 8.8 and 21.76 %; such corn-cockle seed should not be used as a feed.

II. — With a view to estimating the cultural value of the vetch seed rom milling residues, the Royal Hungarian Agricultural Station of Magyaróvár carried out in the course of 1912 and 1913-14, comparative ultural experiment on large scale, both in its own experiment fields, and ith the assistance of various estates in the country.

90 % of these seeds belonged to large-seeded varieties of vetch, namely *Vicia sativa* — *V. segetalis* — *V. striata* M. B. — *V. pannonica* A. — *Vicia villosa* Roth — and ere therefore considered as being a good mixture from the cultural point of view. The omparative experiments made in the spring of 1912 were carried out on vetch seed rom siftings and on the common spring vetch, both of which were mixed with an equa uantity of oats or barley. These experiments showed that, generally speaking, vetch eeds from the milling residues are slower in germinating than the seed of cultivated etch, and that on account of their less vigorous growth, they flower some days later, or nder unfavourable circumstances, even from 1 to 3 weeks later. Further, they usually ive a late cutting. Therefore in districts with a hot climate, vetch seed from siftings hould be grown with oats, rather than with early barley; also, the sowing should be one as early as possible.

(1) See *B.*, 1916, No. 1191. (*Ed.*)

The yield of green forage was estimated in 9 estates, in 2, they were nearly equal, while in the other 7, the common spring vetch produced a heavier crop than the vetch seed from the residues.

The hay yield was also determined in 11 estates; in 3 the crops were equal, but in 8, the superiority of the common vetch was clearly shown.

From the data set forth in several tables, it is seen that vetches from siftings, when sown in the spring, sometimes produce as good a crop as the common vetch; but in the majority of cases, they are less productive. This difference is probably due to the fact that the residual vetches, on account of their weak growth at first, are more susceptible to unfavourable cultural conditions, and especially to bad weather, than the spring vetch, which has a shorter growth period. It is only in regions where the conditions are favourable, that the residual vetches can rival the common vetch from the point of view of their yield. On light soils in somewhat dry districts therefore, they are less suited to replace the common spring vetch.

In the course of the experiments of 1913-14, the residual vetches were sown in autumn together with rye and wheat respectively, and at the same time as the common winter vetch (*V. sativa*), and *V. villosa*. Here again, though in less marked degree, the residual vetches proved inferior as regards germination and development, being somewhat weak at first. This renders it necessary to sow them early in the autumn, so that they may have developed sufficiently before the winter. When this was done, the residual vetches proved almost as cold resistant as *V. villosa*. In the spring, the residual vetches gradually overtook the other vetches grown, and even outstripped the common spring variety which had been sown in the spring and had been the subject of the same series of experiments. The residual vetch and the common winter variety flowered at the same time; but the former flowered from 1 to 4 weeks sooner than the common spring vetch. This proves that the residual vetches rank amongst the early forage plants. As regards yield, the former cannot compete wirth *V. villosa*, but come near the common spring and winter varieties.

The comparative experiments of the 2 years of cultivation also showed that the stems of the residual vetch dry more easily than that of the cultivated vetches, that its leaves do not break so readily when the hay is turned, and that it makes an excellent forage (both when green and when dried), which is readily eaten by animals.

It may be seen from all that has been said, that vetch grown from siftings consisting of the seeds of wild large-seed varieties can, under favourable circumstances, form a good and cheap substitute for cultivated vetch, and that it may constitute an excellent fodder whether fresh, or dried.

281 – **The Drying for Milling Purposes of Damp and Garlicky Wheat.** – Cox, J. H., in *United States Department of Agriculture, Bulletin* No. 455 (Professional Paper), pp. 1-12, Washington, December 2, 1916.

The artificial drying of wheat facilitates the removal of the garlic bulblets by subsequent cleaning; it may also be advantageously adopted by mills, in order to obtain flour free from the smell of garlic.

The experiments described in the bulletin analysed were undertaken for the purpose of determining the best method of artificially drying, cleaning, and handling garlicky wheat. Wild garlic (*Allium vineale*) is

found in the Atlantic coast region from Massachusetts to Georgia, and as far inland as Missouri. The results obtained show that practically no bad effects are produced by drying wheat at 140° F. (60° C.), and that this temperature is probably the most satisfactory for the drying of wheat, either with, or without garlic, for milling purposes. More extensive experiments may show that wheat can be dried at a higher temperature than 140° F. (60° C.) without having a bad effect on the flour as regards its bread-making properties. Every test, except one, where the wheat was dried at 180° F. (82° C.) and above, gave poorer results in the baking test from the standpoint of loaf volume and texture, than when dried at 140° F. (60° C.).

If wheat is dried down to 9 per cent of moisture, or below, for the removal of garlic, great care must be taken in tempering it back to the normal amount of moisture. In order to do this, the wheat should be tempered at least twice, and more if necessary. After the wheat is tempered, it should be stored several hours before mixing, or before another tempering is made, in order to allow the moisture to penetrate into the kernel. Several hours after the last tempering, the wheat should be run from the bin and a thorough mixture made, in order that the grain which passes through the rolls may be mixed as evenly as possible.

282 — **The Retractive Index of Olive Oil and its Relation to Acidity and Rancidness.** — CUTOLO A., in *Le Stazioni Sperimentali agrarie italiane*, Vol. XLIX; Parts 7-8, pp. 377-387. Modena, 1916.

In previous papers, the writer has stated that the refractive index of oils decreases as their acidity increases. This statement has been confirmed by several other writers. The limits assigned to the refractive index of olive oil are a minimum of 62 and a maximum of 63 estimated at 25° C. by the Zeiss refractometer.

The writer has, in fact, during over 10 years always obtained results within these limits. In a series of estimations made in view of the work in question, the writer ascertained the following facts: 1) in new well-prepared oils with an acidity of about 1 per cent. the refractive index is 63; 2) the refractive index decreases with the increase of the free, fatty acids, that is to say with the acidity. 3) The refractive index rises with the increase in the oxidation and polymerisation products, viz., as the oil becomes more rancid. The writer has further determined that the best means of preparing the sample for estimating the refractive index, is to wash it in boiling alcohol and water.

283 — **Cooling Hot-Bottled Pasteurised Milk by Forced Air.** — AYERS, S. H., BOWEN, J. T., JOHNSON, W. T., in *United States Department of Agriculture Bulletin*, No. 420, (Professional Paper) pp. 1-38, Washington, October 27, 1916.

Since 1912, the process of cooling hot-bottled pasteurised milk by means of forced-air draught has been studied in the Dairy Division of the Bureau of Animal Industry in the United States. The first experiments were conducted on a laboratory scale, but the results led to their being extended to a small commercial scale in 1913. This work is the subject of the present paper by the writers.

The results obtained indicate that it is commercially practicable to cool hot pasteurised milk in containers not larger than quart bottles by forcing cold air downward over them when the air is at a temperature of 4.4° C., or lower.

From a hygienic point of view, the important advantage of the process of bottling hot pasteurised milk in hot bottles lies in the fact that bottle infection is eliminated, and if the bottles can be cooled by forced air circulation, the process of pasteurisation would be raised to its highest state of efficiency by a relatively simple process.

The method adopted is as follows. The milk after being pasteurised in ordinary holders for 30 minutes at a temperature of 60–61° C., is bottled hot in special over sized milk bottles which have been sterilised by steam. The bottles are then closed by ordinary sterile caps, and the crates of hot-bottled sterilised milk are cooled by stacking in a refrigerator room and blowing cold air through the crates. In the cold season, outside air could be used, and in the warm season, refrigerated air could be circulated through the crates.

This process was modified, but without obtaining satisfactory results, by substituting for the separate pasteurisation of milk in large vessels and steamed bottles, the pasteurisation of milk, after it had been put in bottles, by means of a current of steam. It had been found impossible to heat the bottles uniformly to 62.8° C. by means of forced air circulation.

The duration of the pasteurising process and the method of cooling the bottles by a cold air current have not been modified.

The writers have collected in this bulletin some experimental data respecting the cooling of hot pasteurised milk in bottles, first by means of the ordinary air, and then by a current of cold air produced by a refrigerator. The following are the points of chief practical importance.

Cooling by means of natural circulation is too slow for satisfactory application on a commercial scale. A bottle of hot milk will cool about ⅓ faster in circulated air than in still air at the same temperature.

When the cold air was forced up through the crates, there was a wide variation in the temperature of the same-sized bottles. This variation was reduced by reversing the current every 15 minutes, first up and then

down through the crates. The best results were obtained when the air was forced down, for by this means, the maximum difference in temperature was reduced to 2. 5° C. and the average to 1. 4° C.

With air at 4. 4° C. forced down through the crates at the rate of approximately 2,500 ft. a minute, the milk was cooled from about 60° C. to 10° C. in about 2 hours. With air at 1. 1° C., and at the rate of about 1,700 ft. a minute, the bottles were cooled through the same range of temperature in approximately 1 hr. and 30 min., and when it was at 6. 6° C. and forced down through the crates at the last-mentioned rate, the bottles were cooled from about 60° C. to about 10° C. in about 1 hr. and 20 min.

Bacterial researches indicate that if milk is cooled from 62. 8° C. to 10° C. within 5 hours after pasteurisation, no more bacterial increase will take place than if the milk were cooled immediately to the same temperature.

In order to have a wide margin for safety, it is well that the cooling process be started immediately after the hot pasteurised milk is bottled and that it be completed within 3 hours. This can easily be done, even where the work is carried out on a commercial scale.

The cooling of milk is absolutely essential in order to restrain bacterial growth and slow natural cooling cannot replace artificial cooling. So far as the laboratory experiments of the writers indicate, the artificial cooling of hot-bottled pasteurised milk has no appreciably detrimental effect on the cream and the flavour of the milk.

284 - **The Increasing Use of Farage Silos on Farms in the United States.** — *Hoards' Dairyman*, Vol. LII, No. 20, pp. 695 and 717. Fort Atkinson, Wis., December, 8, 1916.

The rapid increase in the number of silos used for preserving forage on farms in the United States has induced the Editor of "Hoard's Dairyman" to have the following table compiled. The work has been done at the expense of considerable patience, and the data have been checked and verified as far as possible. The Table not only gives the number of silos existing in the different States of the North American Confederation on July 1, 1916, but also the number erected in the various States during the last financial year. This enables the reader to realise better the rapidity with which the silo is becoming a characteristic rural object and an indispensable adjunct to American farming, whether the farm is stocked with milch cows, or with cattle of all kinds.

The cylindrical, external silo has replaced all other forms of silos and all the other systems of ensilage which were tried when this method of preserving forage first came into vogue.

For these cylindrical, external silos, which are constructed near the cow-houses, different materials are employed. Wood is most commonly

Number of silos in the United States.

States	No. of silos, July 1, 1916	No. of silos erected from July 1, 1915 to July 1, 1916	Aver. capacity tons.	Principal Crops used for silage
Alabama	290	—	—	—
Arizona	86	44	128	Kafir, corn (maize).
Arkansas	1 500	950	75	Corn, sorghum.
California	700	200	100	Corn, sorghum, alfalfa.
Colorado	1 600	265	150	Corn, barley, peas.
Connecticut	1 350	—	100	Corn.
Delaware	700	—	—	—
Florida	100	25	100	Corn, sorghum, Japanese cane.
Georgia	100	25	60	Corn, sorghum.
Idaho	204	—	85	Corn, peas and oats.
Illinois	27 000	6 000	50	Corn, soy beans.
Indiana	26 000	6 000	—	Corn.
Iowa	23 000	1 000	120	Corn.
Kansas	11 343	631	100	Corn, kafir, feterita, milo.
Kentucky	5 000	1 000	85	Corn.
Louisiana	100	—	—	—
Maine	3 000	—	—	—
Maryland	100	—	—	—
Massachusetts	4 257	300	40	Corn.
Michigan	10 000	500	80	Corn.
Minnesota	16 000	2 500	100	Corn.
Mississippi	621	—	100	Corn, sorghum
Missouri	10 000	—	—	Corn.
Montana	150	40	60	Corn, peas and oats.
Nebraska	4 132	—	100	Corn.
Nevada	3	—	60	Corn.
New Hampshire	2 375	—	—	Corn, millet.
New Jersey	1 000	—	75	Corn.
New Mexico	50	—	—	—
New York	42 846	4 000	62	Corn.
North Carolina	400	50	50	Corn.
North Dakota	2 000	150	120	Corn.
Ohio	23 000	4 000	70	Corn.
Oklahoma	3 000	1 000	75	Cane, milo, feterita.
Oregon	1 200	450	55	Corn, oats, and vetch. clover.
Pennsylvania	20 000	2 000	50	Corn.
Rhode Island	700	60	70	Corn, soy beans.
South Carolina	200	62	75	Corn, sorghum.
South Dakota	3 000	600	120	Corn.
Tennessee	300	—	—	—
Texas	450	—	—	—
Utah	350	125	90	Corn.
Vermont	15 000	500	100	Corn.
Virginia	4 000	800	75	Corn
Washington	1 900	750	75	Corn, clover, peas, and oats, wheat.
West Virginia	5 000	1 000	55	Corn.
Wisconsin	55 992	10 000	120	Corn.
Wyoming	61	—	70	Corn, alfalfa, oats, and peas.

used, but concrete in its various forms is a close competitor. In Utah, concrete silos are in the majority, while Oregon reports 90 per cent of its silos as constructed of Oregon fir. In Wisconsin, there are about 50 per cent wooden silos, 40 per cent concrete and 10 per cent of tile, or brick. The only thing which appears to direct the selection of the material is the cost of the latter in the different States, for silos made of wood, cement, bricks, or tiles, seem equally efficacions in preserving forage.

Of all the silage crops, corn (maize) is of first importance in every State, except Arizona and Oklahoma, where on account of the climate Kafir (giant millet) and the Japanese sugar-cane are preferred. Several of the southern States use comparatively large quantities of sorghum and cane, while in the southwest, we find kafir and cane, as well as "feterita" and "milo" (two varieties of sorgum) in much favour. Many States report the use of oats and peas, oats mixed with vetch, wheat mixed with vetch, lucerne, millet and sweet clover. In the Northwest, the grain crops are either grown singly, or in combination with vetch, pea or some other leguminosa, while in California, the first cutting of lucerne is frequently ensiled. A few States report the ensiling of rye, but after maize, sweet sorghums or sugar cane are most used.

Soy beans and cow peas (*Vigna Catjang*) are usually combined with maize, or sorgum. In Wyoming, Russian thistles (*Salsola Kali* var. *Tragus*) and beet tops are used for ensilage; while Montana has some experience in ensiling sunflowers. The change from maize to sunflower silage is reported to have had no bad effect upon last year's milk production.

The use of silos on farms is increasing in the United States, and practically every State reports extensive building preparations. In Wisconsin, which is the State most interested in the dairy industry, there is a silo to every third farm, and about 1 silo to 53 head of cattle. Taken as a whole, the United States have apparently 1 silo for every 66 milch cows, or one silo for every 186 head of cattle of all kinds.

285 - **Experiments Made in Germany on the Treatment and Use of Frozen, Beef.** — KALLERT, E., in *Zeitschrift für Fleisch-und Milchhygiene*, Year 26 Part 10, pp. 241-243; Part 17, pp. 250-261; Part 18, pp. 277-280; Part 19, pp. 292-295; Part 20, pp. 309-312. Berlin, 1910.

At the request of "the Zentral-Einkaufgesellschaft" (Central Purchasing Society) the writer made, in collaboration with Prof. PLANK of Berlin, exhaustive researches on frozen beef. The question was treated both from the standpoint of the wholesomeness of the meat and from that of the technique of the freezing process, but the paper only gives the data relating to the hygenic condition of the meat.

The following points were studied:

1) Freezing.

2) Cold storage.
3) Loss of weight during this storing.
4) Formation of moulds on frozen meat.
5) Thawing.
6) The use of frozen beef by the pork-butcher.

The researches were carried out in several abattoirs in Germany which were provided with a refrigerating plant, and the necessary conditions were as far as possible obtained.

From the results of these researches, the following principles are deduced as to: The freezing of beef, the storage of frozen meat, the thawing process. The following is a summary of the data obtained:

1) Before being placed in the refrigerating chambers, the meat, after having first been freed from the viscera, should be cooled down to a temperature at least as low as that of the surrounding air. Where there are apparatus for pre-cooling, it is well to keep the meat for some time at about + 5° C.

2) During the freezing process, the quarters should be suspended in such a way as not to touch one another, and so that they can be surrounded on all sides by a strong current of air. After allowing for the space required for passages, the freezing chamber may contain 5 fore-quarters, or 4 hind-quarters, per square metre.

3) The average temperature in the freezing chamber should be kept between — 6° and — 8° C. If it is separate from the store, it is not necessary to maintain a definite degree of humidity during freezing. Within the limits of the above-mentioned temperatures, the posterior quarters of 60 kg are completely frozen in 7 days at the longest. It is best to leave the very fat quarters for 1 day more, as the fat layer has a very marked isolating effect.

In the case of hind-quarters of over 60 kg, the length of time required for freezing increases 3 per cent for every 10 per cent increase in weight. Conditions being otherwise equal, the fore-quarters freeze in 25 per cent shorter time than the hind-quarters.

4) Freezing and cold storage can be effected by means of refrigerating pipes alone, or by using them in combination with a cold air pipe.

In the latter case, it is sometimes necessary to increase the current of air by means of a ventilator placed in the ceiling. The refrigerating pipes should, if possible, run above the passages, and care must be taken not to allow hoar-frost to remain upon them. Hoar-frost should also not be permitted to fall upon the meat.

5) The freezing and the cold storage ought, if possible, to be carried out in different places. Should the local condition necessitate the beef being frozen in the store, the successive consignments of meat must be limited, so that the temporary rise in temperature does not exceed — 3° C. The frozen meat in this case should be stacked near the inflow pipe where the air is driest and coldest, while the meat to be frozen ought to be hung near the exhaustion pipe.

6) Only completely frozen meat should be stacked, therefore covering the quarters should be avoided.

As it is necessary for the meat to be surrounded by a current of air, the stacks should not be piled too closely.

In order to facilitate this aeration, laths of wood projecting about 10 cm are laid on the floor of the store; sufficient space is left between the walls and the meat, while

wide passages are left between the stacks; these are indispensable in order to allow of the frequent examination of the meat. With the system of freezing by means of the air alone, and provided the air circulates everywhere in a uniform manner, as much as 500 kg. of meat can be stacked per net cubic metre. If the combined system is used, it is advisable not to stack more than 400 kg. per cubic metre. The stacks may be 2.5 to 3 metres in height, and the top should reach to about 0.5 metre below the inflow air pipes, the latter being provided with openings directed downwards.

7) The temperature of the store should be, at most, — 8° to — 10° C., or even less. Changes of temperature are, as much as possible, to be avoided, therefore the pauses in the work should recur at regular intervals.

The optimum degree of relative humidity measured by a psychrometer provided with an aspirator, is from 90 to 92 per cent, within the above-mentioned limits of temperature.

8) The stored meat must be frequently examined, and a look out kept for any formation of colonies of moulds. If the meat is long stored, it is necessary to take down the stacks, and examine the quarters that have been out of sight. This is indispensable, if there is any formation of moulds on the meat.

Before continuing the work, the moulds should be removed with a knife.

9) When the beef is thawed, the quarters must be kept whole and not divided. If before this operation, any formation of moulds is observed, the fungi must be removed with a wet, or dry cloth, or better still, with a knife. In order to avoid any useless loss of juices owing to too rapid thawing, and, at the same time, to prevent the undue prolonging of this operation, it is well to carry it out at an average temperature of between + 5 and + 6° C. When it is possible to regulate both the temperature and the humidity of the thawing chamber, the thawing operation should begin at 0° and at 70 per cent relative humidity; then the temperature should gradually be raised to from + 10° to + 12° and the humidity to 90 per cent.

At the above-mentioned temperatures, hind-quarters weighing 60 kgs take about 80 hours to thaw, while fore-quarters of the same weight are thawed in about 65 hours. In the case of heavier quarters, the length of time needed for thawing increases 3 per cent for every 10 per cent increase in weight. Meat thus thawed can be kept without injury in cold chambers for at least 8 to 10 days after thawing, and at the usual temperatures, + 2° to + 4° C; the relative humidity being from 75 to 80 per cent.

350 - **Meat Production and Trade in the United States and Other Countries.**

— HOLMES, GEORGE, K., *in United States Department of Agriculture, Office of the Secretary, Report* No. 109, pp. 1 - 307, Washington, July 3, 1916.

The United States is the most prominent nation in the production and consumption of meat. Nevertheless, here, as in most other countries, the cattle are hardly increasing in number, sheep are declining and swine are increasing. If comparison be made with increasing population, sheep are far from maintaining their numbers, in some small degree cattle are failing to do so, but in the case of swine, there has been some gain above population in recent years, although a small one.

The number of cattle in 1907 was 72 534 000; it fell to 56 500 000 in 1913, but there was a perceptible increase in 1916 when it was estimated at 61 441 000.

The number of sheep has fallen from 52 500 000 on April 15, 1910, to 49 200 000 in 1916. The swine have increased from 58 200 000 on April 15, 1910, to 68 000 000 in 1916.

The countries producing much surplus meat are Argentina, Australia, Canada, Denmark, Mexico, New Zealand, the United States and Uruguay. There are other countries that have a relatively small surplus, Paraguay and Madagascar for instance, and many others which export relatively little, while importing more, for example, Germany and Italy.

Substantially, the world's export trade in meat and meat products is maintained by 9 countries. The total of these exports for these countries reached their highest amount, 3 861 000 000 lbs, in 1912. This great quantity, after deducting about 500 000 000 lbs, for mutton, was divided between beef and pork in the ratio of about 52 per cent for beef and 48 per cent for pork, which latter figure shows a tendency to rise.

The export trade of the 9 surplus countries only amounted, in 1912, to about 7.7 per cent of the production of the whole world (without China), which is estimated at about 50 000 000 000 lbs. Argentina and Uruguay together exported 36 per cent of the world's export of meat and meat products in 1912; the United States 31.1 per cent; Australia and New Zealand combined 18.7 per cent; and these three great export sources provided 90 per cent of the worlds' total. In 1912, $^{3}/_{5}$ of the worlds' export trade in beef and its products belonged to Argentina, about $^{1}/_{5}$ to the Australasian Colonies and $^{1}/_{7}$ to the United States; $^{3}/_{4}$ of the exports of pork and pork products go from the United States, about $^{1}/_{5}$ from Denmark and about $^{1}/_{20}$ from Canada. The mutton export trade is mostly confined to the two Australasian colonies and to Argentina, the former contributing $^{3}/_{4}$ and the latter $^{1}/_{4}$.

The United Kingdom is the most prominent meat-importing country and in normal times obtained from surplus countries about 40 per cent of its consumption. Germany held the second place, mostly because of fats and oils, and for the same reason Holland held the third place. In 1913, the United States became the fourth importer of meat and meat products among the importing countries, but these imports are mostly chilled and frozen beef, with some mutton from South America and Australasia.

Meat and its products only represent a very small part of the calories consumed by the world's peoples, for vegetable products, cereals, sugars and fats must be taken into account. A few countries, comparatively, consume the bulk of the world's meat, and the chief of these, the United States, is also the principal producer.

The total meat production of the United States in 1900, was estimated at 16 226 000 000 lbs and in 1909 it reached 16 940 000 000 lbs. If the extra-edible parts are added, these figures would amount to 18 865 000 000 lbs for 1900 and 19 712 000 000 lbs for 1909.

In 1900, the mature cattle slaughtered in the United States were 6.1 per cent. of the stock of cows, and in 1910, 42 per cent. The sheep slaughter, in 1900, was 44.9 per cent. of the stock of ewes, and in 1910, was 46.1 per cent. In 1900, the slaughtered swine were 79.8 per cent of the total stock of swine on hand, and 76.9 per cent in 1910.

If the total meat production is divided among the 500 millions of persons who usually consume this form of food, the per capita average is 93.3 lbs per year.

In the United States, the amount per capita was 181.5 lbs in 1900, and 170.6 in 1909. This is by far the highest consumption per head, except in Australia and New Zealand, where it amounted to 263 and 212 lbs respectively.

The total consumption of meat and meat products in the United States in 1900, is estimated at 13 792 000 000 lbs and in 1909 at 15 450 000 000 lbs. In 1913, Germany consumed 7 399 000 000 lbs, Russia (without Poland) 6 024 000 000 lbs in 1899, the United Kingdom 5 174 000 000 lbs in 1906, and France 3 096 000 000 lbs in 1904. In 1914 and 1915, the United States imported 2.6 and 2.7 per cent respectively of their total beef and mutton consumption including calves. The surplus of all the meat and meat products in the United States was 917 000 000 lbs in 1914 and in 1915.

The losses of meat animals in the United States from disease and exposure are enormous. Since 1900, from 1 100 000 to 1 475 000 cattle have been lost from disease annually and from about 600 000 to 1 500 000 cattle have been lost annually from exposure since 1889. Sheep losses from disease have been about the same as cattle, while the swine losses have varied from a minimum of 2 200 000 head in 1894, to a maximum of 7 000 000 in 1914; they were mainly due to hog cholera.

The prices which have been compiled for producing and consuming countries show an upward trend of prices of meat and meat products. The few exceptions that have been observed are inconsiderable, and indicate that in these instances the country is, for some special reason, unaffected by the world-wide conditions that are so prominently verified in these price compilations.

The general fact is that meat production has not kept pace with the increase of population and the consumers' demand. The inevitable measure of this changed relationship is price. Increasing cost of meat production is a factor in the rise in prices. The United States are not alone in the decline of meat production per head, but are participating in a world-wide movement.

A careful study has been made of the conditions of the Chicago market; the resulting report contains comparisons between the average prices paid from 1893-1897 and those given in 1914 for animals bought

at the farm and at the Chicago market respectively. Cattle, sheep and swine are included.

In the preparation of this report, a separate study was made of meat-producing conditions in 13 countries: Argentina, Australia, Brazil, British South Africa, Canada, Chile, Colombia, Denmark, Madagascar, Mexico, New Zealand, Paraguay and Uraguay. The assembled facts indicate that gradually and at some indefinite future time, Southern Brazil may rival Argentina in meat production; Mexico should eventually produce millions of cattle yearly, Argentina and Uruguay could greatly increase their beef production and Paraguay may follow. Climatic and hydrographical conditions present formidable obstacles to further extension of cattle and sheep rearing in Australia, but to some extent, they may gradually be overcome. Rhodesia has an extensive range area that will yet produce great numbers of cattle and there are other parts of British South Africa which could largely increase their production.

Further, in many places, sheep may undergo a change from almost exclusive wool production to a production of mutton and lamb as well, or perhaps to the subordination of wool.

In Canada, the extension of meat production is increasingly a problem of farm management.

An extraordinary combination of circumstances and factors in all countries, or even in a considerable number of them, to cause a rapid increase of the production of meat is not to be expected, rather, as a net result, gradual growth and extension which may, or may not, equal the rate of increase of the meat-eating population.

The value of cattle, sheep and swine on farms and ranges in the United States on January 1, 1916, was over $ 3 332 000 000.

The value of the farms and farm property with live stock as a principal source of income in 1910 was over $ 15 000 000 000. The value of the capital of whole-slaughtering, and meat-packing, lard-refining and oleomargarine establishments in 1910 was over $ 338 000 000.

In 1910, 32.4 per cent of the population of the United States was agricultural, this proportion was 77.5 per cent in 1840, 47 per cent in 1870, 39 per cent in 1890 and 35 per cent in 1900.

Agricultural labour, as devoted to production of crops, has in these last decades, gained greatly in effectiveness by means of improved machinery, implements and processes. This permits of a relative decline in the agricultural population, as far as crop production is concerned, but it is a question whether this applies in the same degree to meat-animal production. The consumption of crops per head has long increased and the consumption of meat per head has decreased. The displacement of meat in the dietary by products of the vegetable kingdom advances slowly but surely in the United States.

The report contains 30 Tables of statistics and 32 diagrams.

387 - **The Great Cattle Markets of the United States.** — POOLE, JAMES E., in *The Field*, Vol. XXVI, No. 12, pp. 1015-1016 and 1082, New York, December, 1915.

The four principal cattle markets of the United States are Chicago, Kansas City, Omaha and St. Louis. The principal distributing markets are: St. Joseph, Mo., Oklahoma City, Sioux City, St. Paul Minn. and Fort Worth.

The annual traffic of the United States' markets amounts to about 1 million trucks of cattle, sheep and pigs. This figure does not include the return traffic from the markets to the fattening centres. The traffic in cattle is, therefore, enormous. Texas, for example, annually sends half a million head of cattle to the north, chiefly to the pasture-lands of Kansas, Oklahoma, Montana, Wyoming and South Dakota. In autumn the pasture-lands of Kansas feed the fattening stock of Missouri and Illinois, and even include that of Pennsylvania, New York State and Virginia. The two Dakota states, Nebraska and Montana send millions of grazing cattle to the maize district. Between September and December innumerable animals come to the central and eastern states from the breeding-centres of Idaho, Montana and Wyoming to build up the herds. The cattle traffic is the chief source of revenue of many of the western railways.

The appended table shows the number of animals which passed through the principal markets of the United States in 1915, and gives a résumé of the figures for the preceding years.

These enormous markets have their drawbacks, but, nevertheless, they are looked upon as the indispensable clearing-houses of a great industry. In these markets business is transacted daily for payment in cash. The market of Chicago alone brings to the producers an annual profit of over £ 80 000 000, and the same may be said of the markets of Kansas City and Omaha. Every market is run by private firms who make their profits by letting stables, feeding the animals and transport work; for example the firm of Morris controls the markets of St. Louis and Kansas City, the firm of Swift those of St. Joseph and St. Paul, Armour and Swift those of Fort Worth, Sioux City and Denver. The principal markets of the east are controlled by the railway companies. Since the introduction of the refrigerating industry, slaughtering has, for economic reasons, become more and more concentrated in these market centres which offer the buyer the advantage of the largest selection. There is always great competition between these large markets, for purchasers flock to them from New York, Boston, Philadelphia, etc., and it not infrequently happens that regular campaigns are started between the six principal slaughtering and refrigerating firms, for in the United States there are at least 100 other firms, which, though less powerful, represent in themselves a formidable competitive element in the large markets.

Number of Slaughter Animals which passed through the Principal Markets of the United States in 1915 and the Preceding Years.

Market	Cattle	Pigs	Sheep
Chicago	2 262 752	7 652 071	3 510 015
Kansas City	1 860 235	2 530 730	1 814 083
Omaha	1 218 342	2 643 973	3 268 279
St. Louis	991 709	2 591 759	648 142
St. Joseph	405 852	1 697 842	877 930
Sioux City	511 783	1 760 818	337 079
St. Paul	712 918	2 155 201	704 111
Indianopolis	273 212	2 435 319	112 773
Buffalo	236 102	1 805 744	535 128
Milwaukee	99 434	583 071	85 857
Driver	395 922	343 653	765 170
Fort Worth	794 505	463 879	363 063
Oklahoma City	201 968	484 842	68 729
Wichita	153 035	879 469	29 604
Total 1915	10 117 769	27 627 371	13 410 483
Total 1914	9 657 042	24 173 384	15 083 030
Total 1913	10 746 965	27 083 756	17 641 278
Total 1912	10 588 053	26 562 171	17 909 965
Total 1911	10 860 533	27 273 291	17 495 570

The contracts drawn up in each market are controlled by two organisations: the "Live Stock Exchange", which acts on behalf of the producers, and the "Trader's Exchange", which acts on behalf of the traders, and for its own benefit. This latter organisation is composed of traders and speculators who, as a rule, specialise in one particular variety of stock.

The control of the commission markets is in the hands of the Chicago "National Live Stock Exchange", which is made up of various local exchanges.

The central cattle market fulfills a necessity. Theoretically, cattle should be slaughtered near the centre of consumption, but, practically this is impossible in the United States. Under these conditions the economy of centralisation is obvious, and, so long as most of the consumers are to the east of Chicago while the greater part of the cattle, pigs and sheep for consumption are produced in the west, the central market with its huge side industries will have a legitimate economic function.

PLANT DISEASES

GENERAL INFORMATION.

188 - **Decree of the Italian Minister of Agriculture, Prohibiting the Export of Various Plants and Parts of Plants.** — *Gazzetta Ufficiale del Regno d'Italia*, Year 1917, No. 5, pp. 81–82. Rome, January 8, 1917.

Under date of December 8, 1916, the Minister of Agriculture, seeing the necessity of preventing the further diffusion in the Kingdom of plant diseases, at present limited to certain zones, published the following decree, which came into force on January 9, 1917:

Art. 1. — The export is prohibited of:

a) cuttings or rooted cuttings of vines from districts declared to be infected with " bramble-leaf " (" arricciamento " or " roncet ".)

b) chestnut trees from districts declared to be infected with " ink disease ";

c) seeds of forage leguminosae, or flax, from districts declared to be infected with dodder.

d) almond, or pear trees from districts declared to be infected with *Aonidiella inopinata* (*A. robusta*).

Art. 2. — On the proposal of the Delegate of the Phytopathological Service, and by the decree of the Minister of Agriculture, the boundaries of the infected area shall be determined and the destructive, or curative, measures to be adopted according to the cases (Art. 22 of the regulation of March 12, 1916, No. 723). (1).

Art. 3. — The delegate of the Phytopathological Service may not grant certificates of immunity, according to article 8 of the above-mentioned regulation, for the plants mentioned in article 1. of the present decree, which are cultivated within the limits of the area declared to be infected.

(1) The Statute providing for the execution of the law of June 1913, No. 888, dealing with the measures for the Prevention and Control of Plant Diseases in Italy. See *B.* August 1913, No. 995.

Art. 4. — The delegates of the Phytopathological Service are required to sequestrate plants, or portions of plants, offered for sale or supplied for propagating purposes, if they are infected with any of the diseases enumerated in Art. 1. of the present decree, or with any of the following diseases:

a) cuttings, rooted cuttings, or woody plants infected with " root-rot ", " gummosis ", or " canker ";

b) saplings or trees of Canada poplar infected with *Dothichiza populea*. (Poplar canker);

c) rhizomes, or off-set shoots of asparagus infected with *Zopfia rhizophila;*

d) plants, or rooted cuttings, and cuttings attacked by the scale insect (*Ceroplastes sinensis*);

e) all parts of citrus, and other trees with persistent leaves, attacked by one of the following scale insects: *Icerya purchasei, Parlatoria zizyphi, Chrysomphalus dictyospermi, Aonidiella aurantii;*

f) trees, or saplings, and cuttings attacked by *Diaspis pentagona;*

g) apple trees attacked by the Woolly aphis (*Schizoneura lanigera*).

Art. 5. — The directors of the regional observatories, after having satisfied themselves of the presence of any one of the diseases mentioned in Art. 4 of the present decree, shall inform the persons interested of the measures of cure, or of disinfection, to be used for a prescribed length of time. If the person interested does not disinfect, or carry out the treatment for the time prescribed, the Director of the regional observatory shall inform the Ministry, which shall proceed according to Art. 22 of the Statute already mentioned.

Art. 6. — The certificate of immunity may not be granted for the respective species of plants, in nurseries, horticultural establishments, or gardens where plants are grown for sale, if the presence there has been certified of any one of the diseases enumerated in Art. 4 of the present decree.

The prohibition will be withdrawn when it has been ascertained that the disease has disappeared in consequence of the application of the treatment prescribed by Art. 5 of the present decree.

289 - **The Phytopathological Inspection of Horticultural and Vine-Growing Establishments Considered as a Factor of Increased Exportation, in France.** — *Feuille d'informations du Ministère du Commerce, de l'Industrie, de l'Agriculture, du Travail, des Postes et des Télégraphes*, Year 22, No. 5, p. 4. Paris January 30, 1917.

The number of horticultural and vine-growing establishments subject to phythopathological inspection is increasing every year.

While there were 83 in 1914, the number increased to 103 in 1915, ıd to 132 in 1916.

The large increase in the value of the plants and vines exported to ıuntries requiring phytopathological certificates, in spite of the present ıdition of affairs, is also worthy of note

In 1914, the value of the exports was 1,464,986 francs; in 1915, it ıs 2,466,110 fr.; and in 1916, 3,447,900 fr.

It is to be foreseen that these exports will continue to increase, thanks the health certificates offered by the French Government to the ıporting countries, which are thus able to introduce plants with perfect ınfidence, knowing them to be certified as free from all injurious ırasites.

The establishments under State control were divided, in 1916, into districts, and the inspection of the crops was undertaken by 26 ento- ologists and cryptogamists under the direction of Dr. MARCHAL, a ember of the Institute, and Director of the Paris State Entomological ıation.

In accordance with the decree of February 1915 organising the Phyto- ıthological Service, (1) exporting nursery-gardeners receiving health ırtificates are required to defray the expenses of the Service; in 1916, ıey paid, in addition to a fixed annual tax of 25 fr., a tax of 1 fr. 55 ır 1000.

DISEASES NOT DUE TO PARASITES OR OF UNKNOWN ORIGIN.

ıo - **"False Blossom", a Disease of Cranberry (*Oxycoccus macrocarpus*) in the United States of America.** (2) — SHEAR, C. L. in *The United States Department of Agriculture, Bulletin* 444, 8 pp. 2 fig., 4 pl., Washington, D. C., 1916.

One of the most important characteristics of the disease of *Oxycoccus ıacrocarpus*, commonly known in Wisconsin as "false blossom", is the formation or metamorphosis of the floral organs. In the simplest form deformation the floral pedicels are seen to become more or less erect ıstead of curving, and the lobes of the calix become enlarged and turn eenish and somewhat leaf-like: the petals become shorter and broader d slightly reddish or greenish in colour; the stamens and the pistil seem ore or less abortive or deformed; fruit is not produced.

(1) See *B.*, April 1915, No. 438.

(2) See also B., April 1916, No. 470. (*Ed.*)

As a rule all the intermediate stages of deformation may be found in plants attacked by the disease, from the simple form in which only a shortening and broadening of part of the perianth is produced, to the form in which the whole flower is replaced by a short branch with small leaves. In certain cases the various floral organs may be represented by whorls of green bodies, resembling leaves, and arranged on elongated axes. Diseased plants also tend to develop lateral branches by means of axillary buds, usually in the latent state and situated beneath the fruit bud. The branches are thin and weak and produce neither normal flowers nor fruit. This gives the plant the same appearance as plants attacked by "witch's broom". In certain cases the extremity of the floral branch continues to develop and produces a long, thin shoot, instead of bearing a fruit bud for the subsequent season, as is the case with normal plants. In swampy ground, where this deformity usually occurs, the plants of *O. macrocarpus* show an excessive vegetative growth and generally produce a deep, dense mass of branches. In the latent state the terminal buds often become enlarged and abnormal and die during the winter. Under these conditions they produce few branches, all of which are long and thin.

The disease in question seems to have made its first appearance in Wisconsin, but, with the introduction from Wisconsin of diseased *Oxycoccus*, it has started to spread through Massachussetts, New Jersey, Oregon and Washington State. The cause of the disease is unknown; up to the present there is nothing to prove that it is due either to insects or fungi. It has been suggested that the deformity may originate in serious disorder of the nutritive functions of the plant.

The disease is perpetuated from one year to another by plants vegetatively reproduced from diseased plants, not only in swampy ground where the deformity has already appeared, but even under rather more favourable conditions of cultivation and in districts where the disease was previously unknown.

From observations carried out in Wisconsin and Oregon it seems that shoots of plants attacked by "false blossom" tend to recover and become normal if they are transplanted and cultivated under favourable conditions of soil and moisture.

To cure the disease the plant must be given the maximum conditions favourable to its development, including good drainage, freedom from weeds and careful pruning. If the diseased plants are numerous, the ground should be cleared and healthy *Oxycoccus* plants put in.

In order to avoid subsequent spreading of the disease it is wise to plant only samples of *Oxycoccus* which are known to the absolutely free from the deformity described.

291 - **The Defective Development of Walnut Shells in Austria.** — LINSBAUER, L., in *Zeitschrift für Pflanzenkrankheiten*, Vol. 26, Part 8, pp. 449-451. Stuttgart, January 15, 1917.

Last autumn, in the district of Klosterneuburg, the writer found some fruits of *Juglans regia* which were distinguished by a more, or less, defective development of the shell. The latter was not of the same thickness throughout, and in some parts, it was very thin. On studying this anomaly carefully, the writer found that it was a question of the same phenomenon to which MEMMLER (in *Die Gartenwelt*, Part 53, 1915) and OBERSTEIN (in *Centralblatt für Bakteriologie, Parasitenkunde und Infektionskrankheiten*, Part 2, Vol. 45, Nos. 18-25) had already drawn attention.

As these two scientists had given a description of the defective shells, the writer only deals with some characteristic points which have not hitherto been mentioned.

In the fruits examined, the abnormal growth did not always occur on both sides of the suture of the shell; the latter was often badly developed only on one side.

The thin portion was, however, in every case nearer the apex than the base of the nut. It frequently happens that these abnormal walnuts are attacked by birds which remove the kernel.

Although this abnormality is very common, no explanation of it is to be found in phyto-pathological literature. It has been observed, however, for a long time. The writer is of opinion that MEMMLER's and OBERSTEIN's hypothesis as to its origin is incorrect.

The latter observers attribute the unequal thickness of the walnut shell to the unfavourable climatic conditions obtaining in 1915, when they consider this defect occurred for the first time. It is true that certain conditions of climate and of soil have some effect, but the abnormality is chiefly due to an inherent characteristic of the variety. Walnuts which generally have thin shells, are more subject to this unequal development than those with thick shells.

In conclusion, the writer remarks that this abnormality in the walnut is perhaps analogous to that occurring frequently in apricots, almonds and cherries.

DISEASES DUE TO FUNGS, BACTERIA AND OTHER PLANTS.

292 - **Host Plants of *Thielavia basicola* (1).** — JOHNSON, JAMES, in *Journal of Agricultural Research*, Vol. VII, No. 6, pp. 289-300, pl. 18-19. Washington, D. C., 1916.

From 1850 to 1916, different workers have recorded, in Europe and America, the following 39 plants as hosts of the ascomycete, *Thielavia basicola* Zopf.

Araliaceae	*Aralia quinquefolia*
Begoniaceae	*Begonia rubra*
»	*Begonia (tuberhybrida?)*
Bignoniaceae	*Catalpa speciosa*
Chenopodiaceae	*Beta vulgaris*
»	*Aster* sp.
»	*Senecio elegans*
Compositae	*Scorzonera hispanica*
Cucurbitaceae	*Citrullus vulgaris*
Cruciferae	*Capsella Bursa-pastoris*
»	*Cochlearia Armoracia*
Cyperaceae	*Blysmus compressus*
Hydrophyllaceae	*Nemophila auriculata*
Leguminosae	*Lathyrus odoratus*
»	*Lupinus albus*
»	*L. angustifolius*
»	*L. luteus*
»	*L. Thermis*
»	*Medicago sativa*
»	*Onobrychis Crista-galli*
Leguminosae	*Phaseolus multiflorus*
»	*Ph. vulgaris*
»	*Pisum sativum*
»	*Trifolium hybridum*
»	*T. pratense*
»	*T. repens*
»	*Trigonella coerulea*
»	*Vigna sinensis*
Malvaceae	*Gossypium herbaceum*
Umbelliferae	*Apium graveolens*
»	*Daucus Carota*
»	*Pastinaca sativa*
Orchidaceae	*Cypripedium* sp.
Oxalidaceae	*Oxalis corniculata* var. *stricta*
Primulaceae	*Cyclamen* sp.
Scrophulariaceae	*Linaria canadensis*
Solanaceae	*Nicotiana rustica*
»	*N. Tabacum*
Violaceae	*Viola odorata*

The results given in this study were obtained from experiments carried out almost exclusively in greenhouses partly at Arlington (Virginia) and partly at Madison (Wisconsin). The soil used was either taken from tobacco fields badly infected with *T. basicola*, or else mixed with such soil, in order to corroborate the statements of earlier investigators.

With the exception of seven species already mentioned as hosts of the fungus:

Begonia rubra	*Lupinus angustifolius*
B. (tuberhybrida?)	*L. Thermis*
Blysmus compressus	*Cypripedium* sp.
Nemophila auriculata	

(1) See also *B.* March 1911, No. 1004; *B.* January 1912, No. 234; *B.* May 1912, No. 861; *B.* January 1913, No. 71; *B.* May 1913, No. 520; *B.* July 1913, No. 805; *B.* September 1913 No. 1108; *B.* June 1916, No. 699.

hich could not be experimented upon, on account of the difficulty in rocuring these plants, or their seeds, the other 32 were cultivated, and on 5 of them the fungus was found. These plants are:

Aralia quinquefolia
Catalpa speciosa
Aster sp.
Senecio elegans
Citrullus vulgaris
Capsella Bursa-pastoris
Cochlearia Armoracia
Lathyrus odoratus
Lupinus albus
L. luteus
Medicago sativa
Onobrychis Crista-galli
Phaseolus vulgaris
Pisum sativum
Trifolium hybridum
T. pratense
T. repens
Trigonella coerulea
Vigna sinensis
Gossypium herbaceum
Oxalis corniculata var. *stricta*
Cyclamen sp.
Linaria canadensis
Nicotiana Tabacum
Viola odorata

Infection could not be obtained upon the following plants:

Beta vulgaris
Scorzonera hispanica
Phaseolus multiflorus
Apium graveolens
Daucus Carota
Pastinaca sativa
Nicotiana rustica

The above should be excluded from the list of hosts of *T. basicola*, until rther corroboratory evidence of infection is obtained.

As the experiments with infected soil were carried out upon a large umber of other plants, including those most usually grown, and belonging ot only to the families already mentioned, but also to others (*Gramineae*, *iliaceae*, *Linaceae*, *Rosaceae*, *Urticaceae*, etc.) it was possible to add 66 new pecies to the plants already reported and corroborated as host plants of *basicola*. These are:

goniaceae . . . *Begonia semperflorens*	Leguminosae. . . *Trifolium incarnatum*
nvolvulaceae. . *Ipomoea coccinea*	» . . . *Trigonella Foenum graecum*
urbitaceae . . *Cucumis aculangulus*	» . . . *Ulex europaeus*
» . . . *C. flexuosus*	» . . . *Vicia Faba*
» . . . *C. sativa*	» . . . *V. villosa*
» . . . *Cucurbita maxima*	Orchidaceae . . *Paphiopedilum Grossianum*
» . . . *C. Melo*	Papaveraceae. . . *Papaver nudicaule*
» . . . *C. moschata*	Polemoniaceae . . *Phlox Drummondii*
» . . . *C. Pepo*	Portulacaceae . . *Portulaca oleracea*
drophyllaceae . *Nemophila aurita*	
» . . . *N. insignis*	

Leguminosae	*Arachis hypogaea*	Scrophulariaceae	*Linaria Cymbalaria*
»	*Astralagus sinicus*	»	*L. maroccana*
»	*Cassia Chamaecrista*	Solanaceae	*Datura cornucopia*
»	*Cytisus scoparius*	»	*D. Metel*
»	*Desmodium tortuosum*	»	*D. Stramonium*
»	*Dolichos Lablab*	»	*D. Tatula*
»	*Galactia* sp.	»	*Nicotiana alba*
»	*Glycine hyspida*	»	*N. angustifolia*
»	*Lens esculenta*	»	*N. atropurpurea*
»	*Lespedeza striata*	»	*N. calyciflora*
»	*Lotus corniculatus*	»	*N. chinensis*
»	*L. villosus*	»	*N. glauca*
»	*Lupinus hirsutus*	»	*N. glutinosa*
»	*Medicago denticulata*	»	*N. Langsdorfii*
»	*Melilotus alba*	»	*N. laterrima*
»	*M. indica*	»	*N. longiflora*
»	*Onobrychis viciaefolia*	»	*N. macrophylla*
»	*Ornithopus sativus*	»	*N. repanda*
»	*Phaseolus acutifolius*	»	*N. Sanderae*
»	*Robinia Pseudoacacia*	»	*N. silvestris*
»	*Sclotis chinensis*	»	*Petunia* (hybrids)
»	*Strophostyles helvola*	»	*Solanum carolinense*
»	*Tephrosia virginiana*	Violaceae	*Viola tricolor*

It results from the above lists that the plants primarily attacked by *T. basicola* are members of the *Leguminosae*, *Solanaceae*, and *Cucurbitaceae*, the other families mentioned contain few hosts of this fungus. The writer's experiments also showed that a great difference exists in the susceptibility of the various species, and that where earlier workers have been inclined to doubt the parasitism of *T. basicola*, it appears to have been due to the fact that infection experiments were carried on with what now are known to be immune, or very resistant, plants.

Although Messrs. MASSEE and ROSENBAUM have recorded the occurrence of *T. basicola* in certain cases on stems above the surface of the ground, this is but rarely observed. Ordinarily, according to the writer, infection occurs only on the roots of the host plant, or upon the base of the stem just at, or below, the surface of the soil.

Other observations were made in the course of these experiments as regards the fructifications of the parasite.

The conidial spore form is only rarely seen on the living host although it is produced early and abundantly in culture medium. The size, shape, number, and colour of the chlamydospores produced upon the various hosts differed to some extent. These differences appear to be determined in part by the location of these spore chains, that is to say whether they are formed inside, or outside the cells of the host plant.

Many workers have questioned the connection of the perithecia as described by ZOPF with the clamydospores of *T. basicola*. The association of the perithecia upon a large number of the different host plants observed in these tests with the chlamydospore stage of *T. basicola* is fairly convincing as to the connection, maintained by ZOPF, of the ascophore form with the clamydospore of *T. basicola*.

The infection of nearly 100 different species of plants with *T. basicola* from tobacco is further evidence that no specialised races of this fungus appear to exist.

293 - ***Chalaropsis thielavioides* n. g. and n. sp. a Parasite of the White Lupin in Latium.**— PEYRONEL, BENIAMINO, in *Le stazioni sperimentali agrarie italiane*, Vol. XLIX, Part II, pp. 583-596, fig. 1-5, Pl. II-VI, Modena, 1916.

A description of a disease of the stem and roots of *Lupinus albus* observed in 1915, at Velletri, Genzano, and Albano, and which also occurred in 1916, in Rome. This disease may have been previously noticed, but probably it was confused with the root rot due to *Thielaviopsis basicola*, the conidial form of *Thielavia basicola*.

There first appear at the base of the stem in the hypocotyl region, or near the scars left by the cotyledons and the first leaves that have fallen, elongated, reddish-brown patches. These gradually extend and finally occupy the whole base of the stem, the affected portion appearing almost as if charred.

Soon the epidermis of the diseased zone splits and numerous longitudinal cracks appear, and if the air is very damp, a great mass of white powder is produced, the greater part of which falls upon the previously-formed brown patches and conceals them. Later, if the season again becomes dry, this white powder disappears, and the base of the stem is then covered with a more or less abundant black powder. From the stem the disease can proceed to the root system.

In the end, the youngest and weakest plants attacked become bent to the ground and then wither and die. The better developed individuals, on the other hand, do not appear to suffer greatly, and unless, as often happens, secondary diseases supervene, which are due to *Fusarium vasinfectum* or *Sclerotinia Libertiana*, and are greatly promoted by the numerous rents produced by the disease in the epidermis of the lupin, the plants may flower and produce normal seed.

The disease in question is caused by a fungus described under the name of *Chalarops s thielavioides* by the writer, who thus makes a genus and species new to science.

This parasite has a hyaline, or sub-hyaline, septate, and ramified mycelium giving rise to macroconidia (or chlamydospores), and to microconidia.

The former are brown, with very thick walls, and occur at the end of the short, lateral ramifications of mycelium into which they are directly inserted.

It is the macroconidia and also the dead tissues which, seen through the epidermis of the host plant, produce the above-mentioned brown patches. According to the writer, the macronidia, which seen in mass look like black powder, serve to preserve the species when the environmental conditions are unfavourable, and especially when the humidity necessary for the normal development of the fungus is wanting.

The hyaline and delicate microconidia, on the other hand, develop within superficial conidiophores whence they emerge united together in short chains. It is these microconidia which form the white powder observed on the infected portions of the stem. In the writer's opinion, their function is to reproduce the species when the conditions are favourable.

This fungus can be grown, both from macroconidia and microconidia, with the greatest ease on artificial media. The writer draws attention to the fact that, in all probability, it can develop equally well under saprophytic, or parasitic, condition. Numerous artificial infection experiments carried out on young plants of *Lupinus* grown in pots in very damp surroundings, invariably gave negative results and the epidermis of the plants remained intact. The experiments, however, always succeeded well if the fungus spores were sown on even a slight wound, or if injections were made with an ordinary Pravaz syringe, using distilled water with these fungus spores in suspension. In this way, the writer obtained the formation of macroconidia and microconidia even in cotyledons, and he thinks it not improbable that the cotyledons which have fallen on the ground, serve as a temporary substratum for the fungus, and thus help to spread the disease.

As a prophylactic measure, seeing that according to the observations made, damp is the factor which most promotes the development of the disease, it is advisable not to sow the seeds too thickly, so that the plants can be well aerated, and that the sun's rays can penetrate between the stems.

If the disease is very severe, it is best to pull up and destroy the infected plants, and not to use the healthy ones for green manure. In order to eradicate the disease, it would be necessary, for some years, to substitute another crop, such as cereals, for *Lupinus*, or any other herbaceous plant likely to be attacked.

94 - ***Solanum nigrum* and *S. Dulcamara*, Host Plants of *Synchytrium endobioticum* (*Chrysophlyctis endobiotica*), in Great Britain** (1). — COTTON, A. D., in *Royal Botanic Gardens, Kew. Bulletin of Miscellaneous Information*, No. 10, pp. 272-275, London, 1916.

Wart Disease, or Black Scab, caused by the fungus *Synchytrium ndobioticum* Perc. has caused very serious loss to the potato crops in many f the northern counties of England, and in part of Scotland.

Although certain varieties of potato have been proved to be not merely ighly resistant, but for the present, at any rate, immune to Wart Disease, t is important to combat the fungus causing it. This can only be done y a complete and accurate knowledge of the life history of the parasite.

Many cases are known where Wart Disease has reappeared when ealthy potatoes have been planted on infected land after an interval of or 3 years, and several well authenticated records exist of disease appearng after a 6, or 7, years' interval.

Several explanations of such a recurrence of disease have been suggested.)ne hypothesis is, that the fungus may, in the absence of potatoes, have ttacked other plants and managed to maintain an existence in their tissues.

As the casual examination of the roots of all kinds of weeds which ccur in diseased potato field had given a negative result, a series of pot xperiments were carried out in the spring of 1916 at the Pathological laboatory at Kew in order to throw light upon the problem. It was decided to test h the first place *Solanum dulcamara* and *S. nigrum* as being the most likely olanaceae to be susceptible to disease, for they occur frequently in potato elds. The latter plant is also very common in certain Wart Disease areas.

The examination of the plants raised from seed sown in pots of infected il from Ormskirk (Lancashire), showed conclusively that Wart Disease capable of attacking and infecting, though to a moderate extent, both *lanum nigrum* and *S. dulcamara*. It is therefore quite possible that nen attempts are being made to eradicate the disease by discontinuance potato-growing, or by the cultivation only of immune varieties, these o plants may act as host for *Synchytrium endobioticum* and may almost said to act as " carriers ".

Of great interest is the question of the original infection of the otato plant and the possibility of *Synchytrium* having spread from wild olanums to the potato. Wart Disease was first described from Hungary and is by no means inconceivable that a minute and hitherto unknown fungus ch as *Synchytrium endobioticum* should have passed from wild plants to e cultivated, either in that country, or in any other where it was endemic.

(1) See also *B.* July 1913, pp. 1035-1036; *B.* January 1914, No. 76; *B.* February 1914, . 182; *B.* October 1914, No. 956; *B.* December 1914, pp. 1788, 1792; B. August 1916, . 938. (*Ed.*)

WEEDS AND PARASITIC FLOWERING PLANTS.

295 - ***Gomphocarpus fruticosus* and *G. physocarpus*, Naturalised Weeds in Queensland (Australia).** — BAILEY, J. F. and WHITE, C. T., in *Queensland Agricultural Journal*, Vol. VI, Part 2, pp. 104-106, 10 Plates, Brisbane, August 1916.

A description of two weeds *Gomphocarpus fruticosus* R. Br. and *G. physocarpus* E. Mey belonging the the order *Asclepiadeae*, and generally known as " Wild cotton ".

G. fruticosus, which is a native of Africa, is also found in the Mascarene Islands, Madeira, Canaries, Arabia and Southern Europe, perhaps naturalised in some of these latter places. It has long been a naturalised weed in New South Wales, where it is usually known as " Cape Cotton ". In Queensland, it was first recorded as naturalised in 1892, and since that time has spread so rapidly, that it has become one of the worst weeds there.

G. physocarpus is a native of South and Tropical Africa and of the Cape Verde Islands. It is here recorded for the first time as naturalised in Queensland, but is apparently not so common as *G. fruticosus*.

These plants have several times been suspected of causing losses amongst stock and as they belong to the *Asclepiadae*, this most likely has some foundation, but though very common weeds, they seem to be seldom eaten by animals.

The down, or silk cotton, surrounding the seeds is of no use for textile purposes, and could only be used in the same way as kapok, but it would not pay to collect it for this purpose. The best method of eradicating these weeds is to hoe, or pull them up if they are young; or, if the plants are large and fruiting, to cut them below the surface of the ground and burn them when dry.

INJURIOUS INSECTS AND OTHER ANIMALS.

296 - ***Microgaster glomeratus*, a Braconid Observed on Wheat, in Austria.** — KUTIN, ADOLF., in *Zeitschrift für Pflanzenkrankheiten*, Vol. 26, Part 8, pp. 452-454, Stuttgart, January 15, 1917.

At the beginning of May 1916, the Phytopathological Station of the Academy of Agriculture of Tabor (Bohemia) received from one of the communes in the neighbourhood of Prague some ears of wheat to which were attached numerous cocoons of a small Braconid, later identified as *Microgaster glomeratus*. As is well known, the adult insect lays its eggs in the larvae of *Pieris brassicae* (" large Garden white "), and is therefore very useful. The caterpillars which are attacked crawl, before dying, on to walls, hedges, etc., where they subsequently perish in the midst of

numerous braconid cocoons. In the case in question, they retired to die on wheat plants, which was a circumstance not hitherto observed in Austria. According to the farmers, this phenomenon is very common and has been noticed even in different, separate plots.

The cocoons were not all attached to the ear in the same manner. ndeed, the writer found that often the threads of the cocoons surrounded he whole ear, while in other cases, the cocoon was only attached to one ide. The portion of the ear to which the cocoons were affixed also varies reatly; cocoons can be seen on the apex, middle, or base of the ear. \s a rule, only one group of cocoons was found on each wheat ear, but t was not an uncommon occurrence to see two.

The presence of the cocoons is very injurious in so far that it prevents ir and light having access to the interior of the wheat ear. This results n the abnormal development, or the absence, of the seeds. The writer as observed that the parts of the wheat ear to which the cocoons were ttached bore no seeds.

197 - ***Cassida pallidula*** **(" Egg plant Tortoise Beetle ,,), Parasitic on the Egg-plant and the Potato in Louisiana (United States).** — JONES, T. H., in *United States Department of Agriculture. Bulletin* No. 442, pp. 1-8, fig. 1-3, Washington D. C., October 2, 1916.

During the spring of 1915, the larva of *Cassida pallidula* Boh. was observed in large numbers on the foliage of young egg plants and on the leaves of Irish potato at Bâton Rouge, La.

This beetle, which was already known in the United States as a parasite of the above *Solonaceae*, and also of *Solanum elaeagnifolium*, *S. Carolinense*, *S. Xanti*, etc., has been hitherto reported as occurring in: California, Arizona, New Mexico, Texas, Louisiana — at New Orleans in 1912, it was observed on potato and egg plant and at Bâton Rouge on *S. Carolinense* — Mississippi, Oklahoma, Kansas, Missouri, Indiana, Washington D. C. and Maryland.

The various stages of the insect are described from life-history studies carried on at Bâton Rouge in 1915.

Three females of *C. Pallidula* reared in the insectary deposited respectively, 268, 269 and 231 eggs; the maximum number of eggs laid in one day was 12, and the minimum was 5.

The minimum life cycle in the insectary was found to be 27 days. With a continuous food supply available during the spring, summer and autumn, it is apparent that several generations, perhaps 5, will develop during this time at Bâton Rouge.

Only one insect enemy of *C. pallidula* has been noted, and this is an undetermined egg parasite observed for the first time at Bâton Rouge in August 1915. It appears to destroy only a small percentage of the eggs.

An experiment of spraying the *Cassida* larvae with a 12 per cent solution of arsenate of lead and arsenite of zinc indicates that the beetle can be satisfactorily controlled by the use of arsenical compounds.

298 - ***Nezara viridula*, a Rhynchote Pest of the Tomato, the French Bean and the Potato in New South Wales** (1). — FROGGATT, WALTER, W., in *The Agricultural Gazette of New South Wales*, Vol. XXVII, Part. 9, pp. 649-650. Pl. I. Sydney, 1916.

This cosmopolitan insect is quite a modern introduction into the vegetable gardens of New South Wales, and in the writer's opinion, this is the first record of its identification as an Australian agricultural pest.

Nezara viridula first appeared upon tomato plants in the neighbourhood of Sydney, about five years ago, since when it has increased in numbers, and for the last two years, it has been recorded as attacking the fruits and foliage of the tomato, the leaves and young pods of French beans and potato plants. How far it has extended its range outside the County of Cumberland it is hard to say, but as the species is known in Florida (U. S. A.) as an orange parasite, it may easily become established in the citrus orchards of New South Wales.

As the best means of hindering its diffusion, the writer suggests: the removal and destruction of the egg-infested leaves; the use of an oil-spray, or tobacco and soap wash in the early stages of the development of the insect; shaking the trees and gathering up and destroying the older individuals that fall to the ground.

299 - **The Pear Leaf-Worm (*Gymnonychus californicus* Marlatt), A Hymenopteron Injurious to the Leaves of the Pear Tree in the United States.** — NOUGARET, R. L., DAVIDSON, W. M. and NEWCOMER, E. J., in *United States Department of Agriculture, Bulletin* No. 438, pp. 1-24. Fig. 1-4. Pl. I-II. Washington, D. C. December 11, 1916.

Gymnonychus californicus Marlatt (the pear leaf-worm, or pear sawfly) so far as is known, is a native of the Pacific coast.

It was described from one female taken at Brockport, N. Y., and 10 females collected near Sacramento, (Cal.), by MATTHEW COOKE, in 1881. At that time it was reported also from Natoma and Santa Clara (Cal.). In the spring of 1909, it was quite common in the vicinity of Stanford University (Cal.) and in 1911, it was a pest in Tehama (Cal.), besides being generally distributed throughout the central counties, both on the coast and in the great interior valleys of Sacramento and San Joaquin (?). In 1913, the insect was reported as attacking pear foliage in Oregon. It

(1) See also *B.* February 1913, No. 194 and *E.* May 1913, No. 609. (*Ed.*)

as not been observed in Arizona or Colorado. In the State of Washington, t was found in the Wenatchee Valley in 1914 and 1915. The identification of some larvae found destroying the leaves of pear in Geneva N. Y. in 1894 remains doubtful, but the collection of a specimen of *Gymn. californicus* at Brockport N. Y. indicates it may be found in the East of the United States.

The original hosts of the insect are probably one, or more, species wild plants related to the pear (*Amelanchier*, *Crataegus*, *Sorbus*). As cultivated plants, it is restricted to the different varieties of pear. jury is confined to the foliage, and is done almost entirely by the rva, the presence of which is easily detected by the characteristic cir- lar, or semi-circular, holes it eats in the leaves. Generally, it is of ight economic importance, but in cases of severe attack, trees have en defoliated and have suffered badly.

There is only one generation a year. The adults come out in March id April: the female sex greatly predominating. The eggs are inserted to the pear leaves, and the larvae feed on the foliage for an average eriod of 3 weeks. The larvae may be found on the leaves during April id May; in the State of Washington, the season is perhaps 10 days or fortnight later than in California. Upon acquiring full growth, the rvae drop to the ground, and bury themselves at a slight depth. They eave round themselves a cocoon in which the insect remains a little over months, at first as larva, and later, for a period of 2 or 3 weeks as pupa. At the end of the pupal stage, the adult issues from the cocoon id comes forth from the ground.

The insect seems to have few natural enemies and these are very ieffectual in controlling it.

The following artificial remedies are suggested:

a) Poison spray. — Four pounds lead arsenate to 100 gall. water;

b) Contract spray. — Fish oil soap 4 lbs: water 100 gall.; nico- sulphate (40 per cent concentrate) 1 to 1,200;

c) The Government formula for the control of pear thrips, (*Taeniothrips pyri* Daniel (1).

In the case of ordinary infestation, the latter formula is most effica- us. When the attack is severe and threatens the defoliation of limbs, whole trees: the first of the above remedies should be used. The best

(1) This formula is as follows; 3 % petroleum emulsion (1 hl of hot water, 30 kg fish oil soap; 20 kg of petroleum) to which is added 1 % or 1 ½ % tobacco act (containing 2.75 % of nicotine). Cfr. MERRILL, G. E., « How to Fight the Pear nps », *The Monthly Bulletin of the State Commission of Horticulture*, Vol. I, No. 2, 54-56. Sacramento, California, 1912. (*Ed.*)

time for application is when the largest larvae are about half grown and when the holes in the leaves are not larger than 1/2 inch in diameter. At this time nearly all the eggs have hatched.

300 - ***Laspeyresia molesta*, an Important New Insect Enemy of the Peach and of Other Fruit Trees in the United States.** — QUAINTANCE, A. L., and WOOD, W. B. in *The Journal of Agricultural Research*, Vol. VII, No. 8, pp. 373-38 Plates 26-31. Washington, D. C., November 20, 1916.

This preliminary paper calls attention to the discovery of an insect which is an enemy of the peach and, to a lesser extent, of other fruit trees. It is believed to be new to the United States, and has apparently been hitherto unknown to science.

The insect is a moth belonging to the tortricid genus *Laspeyresia* which contains numerous species of prime importance as pests in different parts of the world.

The present species, described by Mr. BUSCK under the name of *L. molesta*, is very similar to the European *Laspeyria funebrana*, although it differs from the latter in certain respects.

There are several American species closely allied to *L. molesta* - one of these, *L. pyricolana* Murtfeldt, may easily be confused with it. It is however unlikely that *L. molesta* is a native of America, most probably it has been accidentally introduced from Japan, where closely allied species also occur, though the present species has not yet been reported.

So far as is known to the writers, the new insect in the United States is still confined to the District of Columbia. It is very generally present on peach trees in the city of Washington and in adjacent towns in Virginia and Maryland. Examples of injury to the peach by what is believed to be this moth have, however, been seen in the environs of Baltimore. The insect is thought to have been present in the District of Columbia for 4 or 5 years, or perhaps somewhat longer. It was not till the summer of 1916 that it could be carefully studied.

The larvae have been found injuring twigs of the peach, plum, and cherry and the fruit of the peach: the latter tree seems to be its favourite host. Attack on the twigs begins in spring and continues till the autumn. The larvae make burrows in the twigs, but when the latter harden, they come out and feed, more or less, on the exterior, cutting holes and pits into the bark and causing a copious exudation of gum which renders the injury quite conspicuous.

The injuries to the twigs of bearing orchards, while important as interfering with normal growth, are not so serious as the damage caused in nurseries, where the destruction of the terminal growing shoots results in the formation of lateral shoots, and the production of a much-branched and bushy plant unsuitable for nursery stock.

The fruit may be attacked while quite green, the infestation increasing as it approaches maturity.

The larvae perforate the fruit at different places, or take advantage of pre-existing punctures and abrasions. They eat out pockets, or cavities, in the flesh; the inconspicuous entrance holes of the young larvae often render it difficult to detect wormy fruit by exterior examination.

The caterpillar, when full grown, seeks some protected place on different parts of the tree, or even on the ground where it hibernates in silken cocoons, pupation occurring in the spring. The adults appear also in the spring. It would appear that there are 2, and probably 3 broods of larvae each year.

301 - ***Plectrodera scalator*, a Coleopteron injuring *Populus deltoides* and *Salix alba*, in the United States.** — MILLIKEN, F. B., in *United States Department of Agriculture, Bulletin* No. 424 (Professional Paper). pp. 1-7, figs. 1-3, pl. I. Washington, D. C. November 9, 1916.

Plectrodera scalator, Fab. (cottonwood borer) is one of the largest beetles found in Kansas, where it injures shade trees, such as *Populus deltoides* and *Salix alba*.

A description is given of the various stages of the insect and also an account of its life-history and habits.

The females lay their eggs chiefly in cuttings and very young trees, in the stem, or trunk, at, or a little below, the surface of the ground. The young larvae cut the bark and prevent the sap flow, while the larger larvae tunnel the wood, thus weakening the trees against wind.

The eggs are deposited principally during July and August. The larvae work in the trees until the second summer after the eggs hatch: the adults emerge from about the middle of June until the 1st of August.

Oviposition in shade trees may be prevented by a screen cone of galvanised netting. The young larvae can be removed before they injure the tree severely, if the remedial work is done during the first two weeks of September.

Removal of the large larvae from deep tunnels often injures the tree more than would the larvae if they were allowed to remain and complete their development.

INJURIOUS VERTEBRATES.

302 - **Experiments Made in Austria in Protecting Forest Trees (Especially Resinous Kinds) from Injury by Game.** — SEDLACZEK WALTHER, in *Centralblatt für das gesamte Forstwesen*, Year 42, Parts 3/4, pp. 115-134. Vienna, 1916.

For many years, the writer has made use of the most varied means of protecting forest trees in different parts of Austria. A screen round

the threatened trees has, in every case, proved the most efficacious method. Inferior results have been obtained by affixing to the trunks bands coated with a composition of a tar basis (TITLBACH'S system), or by using wire-netting. Less certain methods, which are, however, worthy of trial, consist in surrounding the trunk with branches, or removing with a knife, a small portion of the cortex; in the latter case, the exuding resin on hardening, protects the tree from the teeth of the game. These 3 methods chiefly prevent the bark being stripped off. The best protection against rodents is tow; this should not be simply placed round the trunk, but ought to be glued to it. As a rule, the expense is not very great, but in some districts tow is dear, and in this case, it should only be used for valuable trees. Painting the trunk with "Pinostris" is also advisable and costs less. With the idea that game could be scared away by unpleasant smells, noise, and light, KERN made a little tin stove perforated with many holes and filled with sawdust impregnated with substances producing an acrid smoke while burning. In this, be placed percussion caps to make detonations and flashes of light. The acrid smoke is perceptible at 150-300 paces in the direction of the wind, while from time to time, the caps explode in the stove with a loud report and a bright flash. This apparatus is called the "smoking fox", (rauchender Fuchs) and has been used with success when it was a question of protecting the trees for a short period of time.

ALFREDO RUGGERI, *gerente responsabile.*